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TAMPERE UNIVERSITY OF TECHNOLOGY

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IMPROVING PERFORMANCE MEASUREMENT OF SUPPLIER  
QUALITY IN SOURCING

Master of Science Thesis

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Built Environment on 29<sup>th</sup> January 2018

## ABSTRACT

**JÓZEFINA KARINEN:** Improving performance measurement of supplier quality in sourcing

Master of Science Thesis, 77 pages, 3 Appendix pages

August 2018

Master's Degree Programme in Industrial Engineering and Management

Major: International Sales and Sourcing

Examiner: Associate Professor Teemu Laine and Senior Research Fellow Aki Jääskeläinen

**Keywords:** procurement; sourcing; supplier quality; quality measures; supplier performance

This research was conducted for a case company, which had a need for quality improvement of the suppliers. The problem was the lack of accurate measures that would monitor the supplier quality in the sourcing department. The current quality system in place was not enough to assure good quality products reaching workshop area. The processes were in need of being redesigned.

The objective of the research was to develop measures for supplier quality to be used by sourcing representatives. The research in this thesis is a case study, where multi-method research approach was used. The empirical part of the study focuses on two areas, which are the definition of supplier quality from sourcing point of view and ways of measuring it. Defining supplier quality was done based on the literature review, as well as extensive interviews held within the case company and through benchmarking. These practices resulted in identifying the key quality factors of sourced, which were timeliness of deliveries, conformance to specifications and working as expected. The supplier claiming process was identified to have an effect on solving these quality issues, and hence, was redesigned. The research revealed gap in responsibility ownership, which was affecting the poor execution of current supplier claiming process. Hence, a new position – Supplier Quality Engineer was introduced to the case company structure. Each stakeholder within the supplier claiming process had the appropriate key performance indicators assigned to support maintaining the quality of suppliers. The research took into consideration the upcoming implementation of new enterprise resource planning system, so the steps of the process are supported by the tools.

The renewed supplier claiming process will most likely be implemented in the near future at the case company. The feedback gathered throughout the research process, as well as when presenting results proved the accuracy of the findings. The biggest finding of the research was the lack of the ownership of supplier quality responsibilities, affecting greatly the overall supplier quality at the case company. The recommendations made for the short- and long-term in this thesis work were found very enlightening for the case company representatives.

## PREFACE

I was lucky enough to receive this thesis research project right after spending my summer as a summer worker at Valmet Automation. The experience with the company will forever stay as a significant part of my two-year Master's studies at TUT. The program of my major presented the challenges I was looking for, as I believe we are never done learning.

First, I would like to thank Associate Professor Teemu Laine for taking on the supervision of my topic and inviting Senior Research Aki Jääskeläinen to contribute greatly with his expertise. Both helped significantly with the writing process of this thesis and provided very insightful comments. Also, I would like to express my appreciation towards Juha Luukela, my supervisor at Valmet Automation. While doing the research work, he gave me a lot of support, in both, thesis- and life-related matters. After spending ten months at the company, I would also like to thank my colleagues, who made the coffee breaks the best time of the day. Lastly, I would like to praise the company for keeping my sugar levels high due to all the kakkukahvit I got to experience in the past months.

Most of all, I would like to express my gratitude towards the friends I made during my relatively short stay in Tampere. They were my rock during this challenging time and I would not have made it without them. I would like to especially thank Elisa, who gave me more than I could ever imagine after knowing each other for merely two years. Also, I would like to highlight how grateful I am for the longer friendship of mine with Gabriela, which despite the long-distance survived it all. Thirteen years behind and so many more ahead! I am very thankful for the support I received from my dear mama and my dad, who bear with me and my life decisions. Lastly, very warmhearted thank you goes to Samuli who entered my life so fast, that it feels like he always belonged there. He made my Master's studies truly one of a kind.

Tampere, 15.08.2018

Józefina Karinen

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## LIST OF SYMBOLS AND ABBREVIATIONS

<i>AUT</i>	<i>Valmet Automation</i>
<i>CSR</i>	<i>corporate social responsibility</i>
<i>ERP</i>	<i>Enterprise Resource Planning system</i>
<i>HSE</i>	<i>Health and Safety at Work</i>
<i>LN</i>	<i>Name of the new ERP</i>
<i>NCMR</i>	<i>non-conformance report for material</i>
<i>NCR</i>	<i>non-conformance report for material</i>
<i>RoHS</i>	<i>Restriction of Hazardous Substances Directive</i>
<i>VT</i>	<i>Valmet Technologies</i>

# 1. INTRODUCTION

## 1.1 Research background

Over the past 50 years the role of industrial procurement function has undergone major changes. For many decades purchasing materials has been viewed as rather passive task, until raw material shortages started to take place (Ellram and Carr 1994). Manufacturing companies, once making everything in-house, started to buy components from external sources. Initial drive for low costs and entering global market of sourcing has resulted in emerging quality issues due to low control of the supplier's activities and lack of proper communication of needed technical specifications (Goetsch and Davies 2010, p. 27). This created a new need to monitor the quality of the suppliers of the outsourced production (Goetsch and Davis 2010, p. 9). According to the source, dedicated quality departments did not solve the problem right away as the roles and their assigned responsibilities were not quite clearly known.

Since more and more companies have started to focus on their core competencies and have the rest of the activities outsourced (de Almeida 2007, p. 2), the cost structures of the products have changed quite significantly (Lyly-Yrjänäinen 2017). The purchases from the external sources amounting once for about 50 per cent, now they can be as high as 80 per cent of cost of goods sold (van Weele 2014, p. 12). Industrial companies are highly dependent on their product and service suppliers, as they dictate the cost, quality, technology, delivery and profits the company can make (Krause and Scannell 2002, p. 14). Purchasing companies often point out that the areas of quality, delivery, cost, as well as product design are constantly in need of improvement (Lewis 1998; cited in Krause and Scannell 2002, p. 14; Monczka and Trent, 1991). One of the means used to monitor the suppliers is closely measuring their performance (Krause et al. 1998; Jääskeläinen and Thitz 2018). Finding capable suppliers to meet the requirements of the procurement, especially in the long-term, is not easy and usually demands intervention from the purchasing company (Krause and Scannell 2002, p. 14). De Araújo et al. (2017) depict that maintaining perfection in procurement process is the key to success of any project.

According to de Araújo et al. (2017) in their literature review study, there has been significant increase of interest in addressing the methods for supplier selection and evaluation in recent years, 2007-2015, under the overall project procurement management. After analyzing 119 articles, from which 96 were conceptual, they have found out that the most cited category when selecting supplier is quality, which was followed by cost, personnel abilities, other financials and management practices. In the evaluation phase, the quality aspect was placed second. As it can be seen, measuring quality and securing it for the excellent final product performance is a topic of many research and literature sources.



Depending on a context and user, quality can be defined very differently. In B2B environment, the stakes are high as suppliers have great influence on the entire business of the customer (buyer) (Liu et., al. 2014; cited in de Araújo et al. 2017). However, as it will be explained in the theoretical background of this research, the procurement alone nor the quality department can assure good quality products without collaboration with other departments. Furthermore, using quality as a competitive advantage must be decided on, planned and executed systematically on the strategic level of management (Sower 2011, p.43).

The history of Japanese quality evolution, where the country managed to shake off their poor-quality imago and become world leaders in quality products manufacturing, shows that good quality practices are result of years of systematic and unified work towards the goal (Goetsch and Davis 2010, p. 9). Finding capable suppliers does not yet guarantee the desired quality on a continuous and dependable level (Ellram and Carr 1994). For the suppliers to fulfill specific needs of the buyer, there should be clear communication of what is expected and tangible measures according to which, the performance can be monitored (van Weele 2014, p. 203). In this research, the focus is put more on improving the quality of already existing suppliers, but the researched practices do not exclude using them for the evaluation of new suppliers.

## **1.2 Research context and the case company**

The following thesis work has been done for Valmet Automation Oy located in Tampere. The topic of the thesis has been formed due to a real need of the company to create accurate set of measures that can be used to improve the quality of the suppliers. The company is a project-based business and is confronting efficiency problems with the project deliveries. The struggles are mainly with the on-time and within budget product deliveries to the end customer and quality inconsistency received from the suppliers has been recognized as greatly influencing factor. Also, customer requires more and more concrete and detailed documentation about the components and materials, as well as standards fulfillment to go with their orders. Recently implemented new version of ISO 9001 standard (9001:2015) increases the role and responsibility of the company to monitor the quality of their suppliers.

Valmet Automation (AUT) is one of the four business lines of the Valmet Oyj. The company is one of the global leaders in developing and supplying technologies and innovations for pulp, paper and energy industries. They allow customers to create new revenue streams by improving production performance, cost, energy and material efficiency. The market drivers for the company are ageing machines and automation systems at the customers sites, new investments in pulp and paper machines, as well as power plants. The demand for savings in the raw material department and for sustainability is rising. In 2017 net sales of the AUT business line equaled 296 million € with total headcount of the

employees at 1 636. Value of the orders received amounted 317 million €. Valmet AUT's unique offering includes Distributed Control Systems (DCS), Quality Control Systems (QCS), analyzers and measurements, as well as performance and service solutions. Valmet AUT is a market leader in pulp and paper industry with their accurate and very sensitive measuring and analyzing technologies, and number two with the DCS and QCS products. Main competitor in all three areas is ABB Group. (Flow 2018a)

Procurement at AUT is done globally. The procurement department holds a role of a communication channel where the internal and external parties can keep themselves informed (Dubois and Wynstra 2005). Current ERP implementation taking place in Valmet Automation will offer such interface for the supplier processes improvement. Moreover, enforcing the responsibility of quality in the procurement teams within supply chain for is one of the highlighted steps in the Valmet Procurement Roadmap. One of the goals for 2018 is to put more focus on supplier quality and on-time delivery factors in addition to cost competitiveness. To minimize the quality costs in the long-term, Valmet has ordained more focus to be put into root cause analysis of the quality deviations. (Flow 2018b) Sourcing activities in securing certain quality of the products into supply chain are to be revised. This thesis research will address the topic of supplier quality process and adequate measures that would aid upkeeping the process.

### **1.3 Research objective and questions**

There are two layers of the objective of this thesis. First, the factors of the supplier quality will be determined, together with the influence different roles in the company have on them. Second, the aim is to explain how different quality measures used in the sourcing processes at Valmet Automation (AUT) can support suppliers in delivering good quality.

The aim is to develop such supplier quality process and measures that could be applied to both, already existing and the future suppliers, as a standardized practice. The current supplier quality approach of the case company is to be investigated, both in theory and in practice. The empirical data for this research was mainly gathered through interviews of case company representatives. Also, delegates from the other three business lines of Valmet Corporation were interviewed to compare the processes. Moreover, external companies have been benchmarked to widen the perspective and collect different practices. Benchmarking has been conducted to identify the performance gaps and detect what could be improved. The following three questions will be presented to give this thesis a structure:

*What are the quality dimensions in sourcing?*

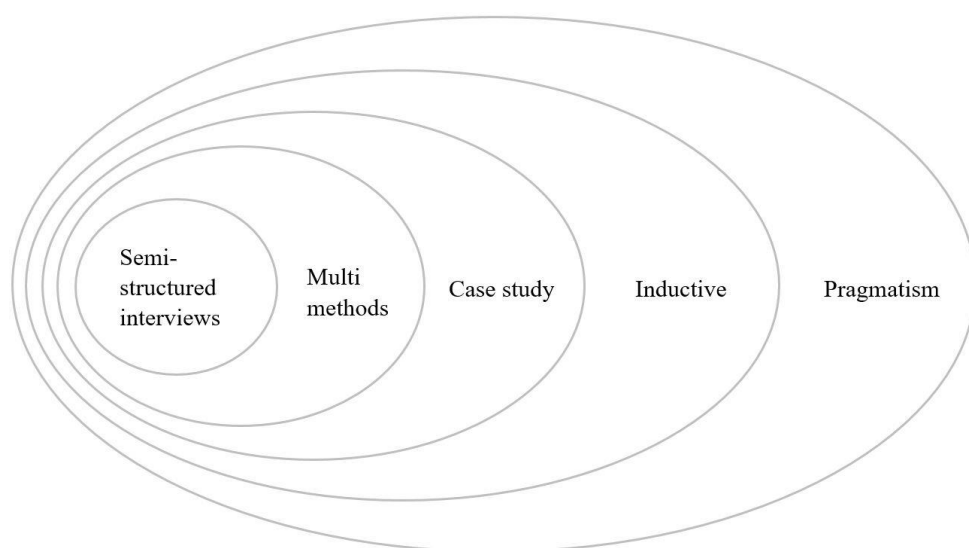
*What are the information needs of quality process in sourcing?*

*How to improve supplier quality measurement and related quality process?*

This thesis will strive to answer these questions as accurately as possible. The information needs required at different stages of quality management processes from the sourcing perspective will be determined. Furthermore, roles needed in managing the information about supplier quality will be discussed. Ideally, different reasons causing poor supplier quality will be determined based on this investigation. The goal from company point of view is creation of KPI set that would aid preventing and monitoring quality fluctuations of suppliers offering. Also, the key roles will be determined and assigned to particular tasks and KPIs in supplier quality assurance. The supplier quality process from sourcing point of view is to be harmonized. The research takes on the purchaser's perspective, but strives to include the supplier's interests as well. The possible gaps between activities that should be performed to ensure good supplier quality and personnel responsible for them will be evaluated.

## 1.4 Research philosophy

To conduct a research properly, a direction must be chosen to achieve relevant and well backed-up outcome. Selecting appropriate methodology does not start with the question whether the researcher should make a survey or interview participants face to face (Saunders et al. 2009, p. 106). It rather starts with outer layers of so called “research onion”, which aims to help in choosing right path for performing the study. The methodology chosen for this particular research is presented in the Figure 1.



**Figure 1.** Research methodology path (adapted from Saunders et al. 2009, p. 108)

Firstly, research philosophy ought to be thought about as it determines the manner a researcher sees the studied problem. Basically, it shows what things matter the most and will have the focus put on. It is a commitment that must be upheld throughout the entire research process. (Saunders et al. 2009, p. 108) As can be seen from the Figure 1, in this study pragmatism philosophy is obtained. Primarily, it assumes that the research questions formation is the most important element. Pragmatic thinking is logical, realistic but not excluding the feelings from the equation. As Saunders et al. (2009, p. 119) point out, the view on a topic within this philosophy is chosen based on the goal of answering the research question the best way possible. Moreover, the researcher's view on the important values can affect the research process. The pragmatic philosophy does not yet determine, whether the technique for data gathering to be chosen should be qualitative (generating non-numerical data) or quantitative (generating numerical data) (Saunders et al. 2009, p. 119; 152).

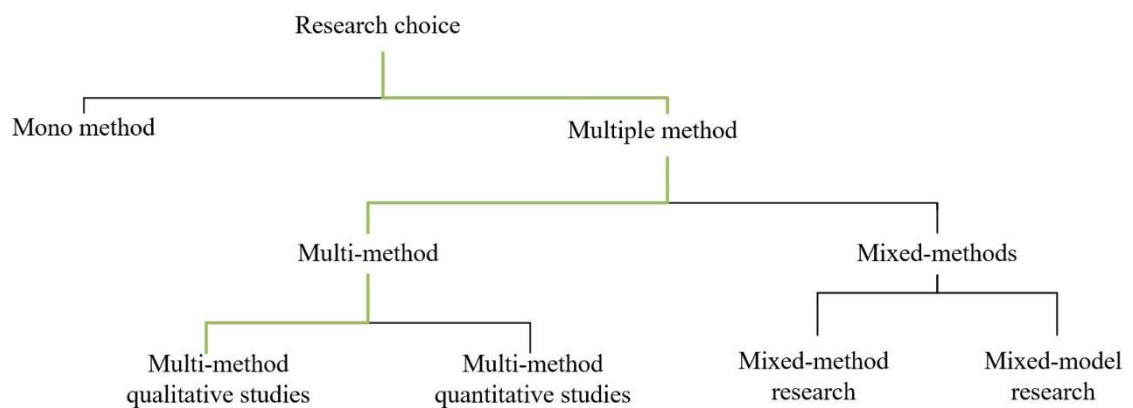
This following thesis work is an applied study, where the implications of the results are going to be tested with the literature findings. There are two approaches for conducting theory research: deductive and inductive. The former includes forming hypothesis and performing objective observations. It aims to test the theories by collecting data and generalize the outcome. (Saunders et al. 2009, p. 124-125) Inductive approach, on the other hand, allows closer participation of the researcher with the focus group. Meaning, the data is being collected first and theory is developed second as opposite to deductive approach. This thesis study aims to answer if supplier quality could be affected and supported from the buyer side, and if, with what kind of measures. To do so, focus group will be closely examined and data collected. Desired outcome would be confirmation of the question. The data collected is qualitative and as Saunders et al. (2009, p.125) reminds, that indicates inductive profile of the research. The developed measures for monitoring or enforcing certain quality, are going to serve as a quantitative data collection for the company's future operations.

Research purposes can be categorized as exploratory, descriptive and explanatory (Saunders et al. 2009, p. 138). Exploratory research aims to uncover new trends, by digging into a problem more deeply. This approach is used when not being sure of the problem's characteristics and understanding the current state of the situation (Saunders et al. 2009, p. 139). Hence, obtaining exploratory perspective allows some flexibility when it comes to continuous changes taking place during the lasting of the research (Saunders et al. 2009, p. 140). The latter, descriptive research is used when the researcher wants to describe things that will be later measured. Here, the understanding of the problem and objective of the research must be well defined, unlike in the previous type (Saunders et al. 2009, p. 140). Finally, explanatory research is well advanced compared to the two former ones described. The goal is to explain different phenomenon more deeply (Saunders et al. 2009, p. 140). Purpose of this thesis is exploratory, as the research objectives

were not certain in the beginning of the research and changed under the influence of data collection.

As a next step, the research questions presented should be turned into research project, which will aid in answering them (Robson 2002; cited in Saunders et al. 2009, p. 136). There are various strategies available to do so, some of which being survey preparation, case study, action research, archival research and more. In this thesis case study strategy is chosen as it allows researching certain phenomenon in real life setting, which in this example is examining supplier quality in Valmet Automation. This strategy supports answering the “why” questions mentioned earlier and fits the explanatory purpose of the research (Saunders et al. 2009, p. 146). Moreover, Gummesson (1993, p. 6) states case study research works well with both qualitative and quantitative data and possibly allows discovering hidden phenomenon not visible at first sight.

Last but not least, research methods are to be determined. Ways of researching can be divided into mono and multiple methods (Saunders et al., 2009, p. 152). The former consists of one, single data collection technique and analysis. The latter, on the other hand, consists of multiple techniques used. The distinction of those can be seen in the Figure 2.



**Figure 2.** *Types of research methods (adapted from Saunders et al., 2009, p. 152).*

From the Figure 2 it can be depicted that this study uses multi-method approach, instead of mixed method. Meaning, more than one data collection method is conducted. However, choosing multi-method requires deciding on either qualitative or quantitative data, whereas mix-methods allow combining the two (Saunders et al. 2009, p. 152). This brings the next made choice of qualitative data to be used in this particular study. In this study, data collection will be performed through semi-structured interviews. Research strategy and data collection techniques are further elaborated in the Chapter 3.

## **1.5 Research structure**

This thesis is structured as follows. In the Chapter 2, the literature review of theoretical background is presented. Firstly, the topic of procurement within supply chain is discussed with the focus especially on the sourcing function. The activities and tasks of the function are presented and then quality aspects within them determined. Secondly, the topic of quality in its broad understanding is defined. Then the definition of quality befitting the purpose of the thesis is introduced. The emphasis of this subchapter is on the supplier quality measurement and its improvement.

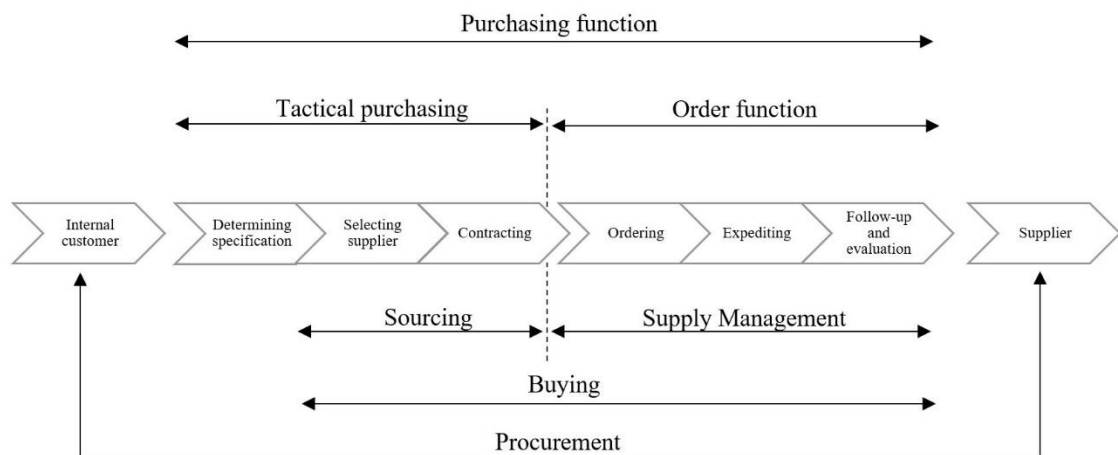
In the Chapter 3 the research focus is further established. The strategy of the research and data collection techniques are showed. Also, the process of the research is showcased. Chapter 4 contains the empirical part of the thesis. The current state of the case company's sourcing team is presented. The understanding of supplier quality, information needed and existing roles and measures are revealed. The link between current status supplier quality and ongoing changes in the ERP implementation in the company is pointed out. To broaden the scope, also the benchmarking results of other companies are part of the empirical research. The chapter ends with new process flow proposal, supplier quality measures and roles to be established.

In the final Chapter 5, summary of the empirical findings, implications of the results in literature and limitations depicted are outlined. Moreover, the implications for the future research are suggested. All appendixes can be found at the end of this document.

## 2. THEORETICAL BACKGROUND

### 2.1 Procurement and sourcing

The academic literature presents a wide variety of terms for the actions of procurement, often used interchangeably. Terms like sourcing, purchasing and buying tend to have similar meanings, but are applied differently. (van Weele 2014, p.8) Moreover, Ellram and Carr (1994) discuss the evolution of the term “purchasing”, which once meant only operative tasks, but now consists also of the strategic approach to buying. However, each of these terminologies have slightly different meanings, when trying to distinguish all the processes in the procurement organization. The following Figure 3 presents a visual, text-book classification of the activities in the procurement process.

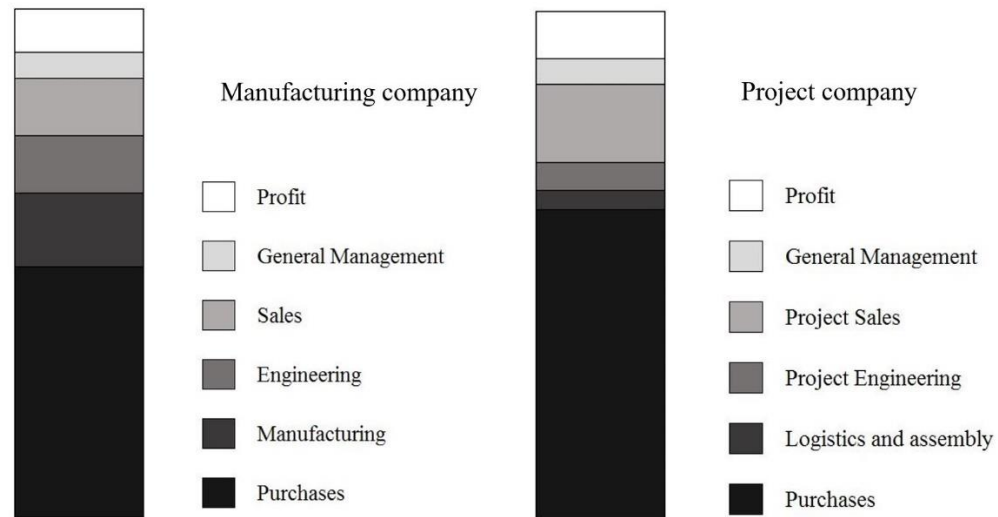


**Figure 3.** Procurement process (adapted from Van Weele 2014, p. 8).

The process starts with the internal customer wanting to make a purchase from the supplier. The purchasing function can be divided into two function parts. First function part is the tactical purchasing, which includes quality and quantity specification, best available supplier selection and contract preparation. The latter two activities contribute to the process of sourcing. The second function part of purchasing is the order function, which combines the operative supply management tasks like placing an order, expedition, follow-up and evaluation. Process of buying is formed from sourcing and supply management together. (Van Weele 2014, p. 8) Supply management was once a separate function from procurement, but over the years it got incorporated into the procurement process as a whole (Ellram and Tate 2015). Approaching supply management appropriately and with consideration of not only the physical product, but also services around its delivery, can benefit company's supply chain's performance (Ellram et al. 2007).

Nowadays, the criticality of purchasing function is at its highest, due to its substantial share in the company's cost structure (van Weele 2014, p. 12; Ellram and Liu, 2002). This

means that purchased resources make up a considerable part of the overall cost of the goods sold (COGS). Depending on a profile of the company, the cost structure differs. In the Figure 4 comparative examples are shown for manufacturing- and project-based companies.



**Figure 4.** Comparative cost structures with departmental divisions of manufacturing and project based companies. (adapted from Lyly-Yrjänäinen 2017)

From the figure, it is seen that the purchasing costs of the overall cost of goods sold can amount to around 50 percent. In a less standardized environment, where the products are more customized for the customer, the purchasing costs can be as high as 60-80 percent of the total amount. (van Weele 2014, p. 12) In this research, the company in question is a project-based company. This means that each customer order is customized. Moreover, the projects contain of assembly process, which means no in-house manufacturing is taking place. Hence, the procurement related issues in this chapter will be presented in the scope of assemblies. As most of the components and sub-assemblies in such companies are purchased outside of the organization (not manufactured in the house), the quality monitoring of those purchases is a top priority (Grocock 1974, p. 115). As stated in the source, project-based company focuses mainly on design, sales and marketing, final assembly and testing.

Procurement function should be oriented into calculating the total cost of ownership (TCO). Meaning the costs of a product's whole lifetime are considered, rather than a single purchase price for the product (van Weele 2014, p. 10). Reducing the purchasing costs even slightly, can bring significant monetary savings on a company level. Procurement's work is greatly affected by forecasting and logistic arrangements. The better those arrangements are, the more efficient work procurement can conduct. (van Weele 2014, p. 13) Another reason to focus on the suppliers more carefully is that they can be a good source of innovations the company could benefit from. In practice, it could almost mean having some of the R&D activities outsourced and developed on more practical level.



This is especially crucial, when companies have limited resources for R&D. (van Weele 2014, p. 53) The companies that approach purchasing with the suppliers in a more cooperative way and treat them like partners, can expect receiving better financial gains than the companies who do not proceed alike (Chen et al. 2004). Hence, the cruciality of finding the right suppliers and securing their excellence in performance is the key to success in business (de Araújo et al. 2017). In the procurement process the strategic choices are being made by sourcing department and are conducted within the steps distinguished in the Figure 5.



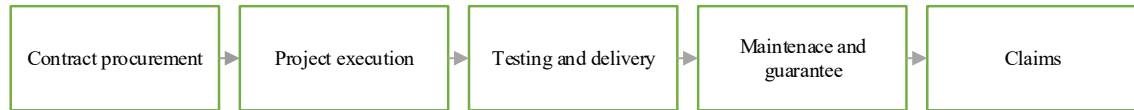
**Figure 5.** *Process of supplier sourcing (adapted from Van Weele 2014, p. 8).*

De Araújo et al. (2017) suggest, that extraordinary attention should be given to supplier selection and supplier evaluation steps. Supplier selection is a stage where the appropriate suppliers are being chosen, whereas supplier evaluation concerns already approved partners who have been carrying work for the purchasing company. Choosing a supplier involves a vast range of activities rather than just simply looking through suppliers' price lists. However, selecting the right supplier starts with having the specifications declared (van Weele, p. 8). The technical requirements should be specified also from the perspective of the purpose of their later use (Behncke et al. 2014).

It has been mentioned (de Almeida 2007, p. 2), that companies constantly look for cost-saving opportunities when procuring components for production. This is also important when selecting suppliers for different supplies. Van Weele (2014, p. 195) presents several reasons why companies decide to opt for cost savings. For example, when the purchasing activities are being still done in a traditional way, meaning with no certain purchasing policy, that is the first sign to make a change. Components are bought from fixed base of suppliers that have always been providing for the company in question. In such case, quite often knowledge of the cost structures of the products are not entirely known and company has been buying overpriced products for years. Because the suppliers affect the customer business greatly, selection of the suppliers has to be very well thought out (Pope et al. 2012).

Having selected a suitable supplier, being able to fulfill the technical requirements stated, a contract should be made. Those usually involve industry specific conditions and terms upon which business is being conducted. In addition to the technical requirements stated, also commercial and legal matters are distinguished in such document. (van Weele 2014, p. 36) Once the contract is established, KPIs should be chosen accordingly to measure the alignment of the contract with supplier performance (van Weele 2014, p. 203).

Last steps of sourcing process are follow-up and evaluation. Despite those activities being previously assigned to the more operative supply management, it is also a responsibility of the sourcing representatives to monitor the outcome of their contracts (van Weele 2014, p. 98). Unlucky choice of suppliers might affect the image of the company within the market (Pope et al. 2012). In the Figure 6, the steps after contract is made are presented.



**Figure 6.** *Post-contracting procurement activities (adapted from van Weele 2014, p. 99)*

First post-contracting activity is naturally project execution. The components are delivered and the project is put in motion. After the manufacturing or assembly is completed, the testing and delivery of the final product to the customer takes place. All post-production maintenance work takes place later on. Finally, in case there are problems that arise, claims are being made to report the non-conformance of the product. Those non-conformances can either be a whole final product or certain parts. Nevertheless, actions to solve those issues have to be taken. The reason for the sourcing to be involved in the post-contracting activities is that complex issues emerging usually do not align with the initial specifications. Van der Puil and van Weele (2013; cited in van Weele 2014, pp. 99-100) drawn up common problems that arise between the sourcing parties and the suppliers, from which some of them are presented in the Table 1.

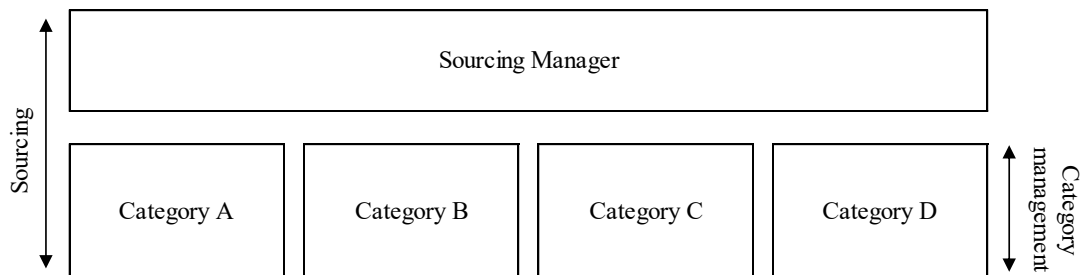
**Table 1.** *Common problems in contract management (adapted from van Weele 2014, pp. 99-100).*

Common issues	
<b>Objective</b> – not equal between sourcing and supplier	Initial agreement and capability of the supplier to fulfill the work can change alongside process progress
<b>Knowledge and expertise</b> – lack of if at the sourcing side	Unclear technical specifications given and supplier are overload with questions about the techniques and solutions
<b>Stakeholders</b> – high in number and detailed relationship	Extra approval of different parts and continuous dialogue with the suppliers
<b>Decision making</b> – insufficient due to hierarchical structure	Decisions postponed due to not taking immediate actions by people who are qualified enough to make certain decisions
<b>Scope</b> – frequent changes in planning	Changing the specifications from the original input
<b>Common understanding</b> – differing of what was agreed	Realization upon completing about different interpretations of the requirements
<b>Payment terms</b> – delays in money transfer	Different payment times: when delivering the component or when validating its performance

Worth highlighting is the distinction of payment terms: nowadays sourcing representatives more and more do not agree to pay for their orders before the components reach the workshop site and prove to be in accordance with quality requirements. (van Weele 2014, p. 101) To reach the competitive advantage companies source not only from the developed countries, but also from the low-cost countries. Ruamsook et al. (2009) in their study summarize the common issues that arise when sourcing from the latter countries. These issues might be the transportation and logistics and the performance of the delivery. Moreover, the quality is one of the top challenge, as well as the sustainability aspect of suppliers. Finally, the communication ability and the competence of the supplying companies present difficulties. (Ruamsook et al. 2009) Based on the presented issues in the table 1, that arise when sourcing, it can be seen that the process is complex and requires substantial expertise and skills to navigate successfully. Successful contract management can help to minimize the effect of the challenges when sourcing. (van Weele 2014, pp. 100-101)

### 2.1.1 Sourcing activities and tasks

According to van Weele (2014, p. 10) sourcing primarily focuses on discovering, choosing and drawing contracts, as well as maintaining the most optimal supplier offering available on a domestic or global scale, depending on a strategy. Moreover, strategy choice includes also decisions about the number of suppliers to purchase goods from, the relationship company wants to establish with them and the type of contract that should be drawn. The goal of sourcing is to optimally create the best supplier strategy for particular product category (van Weele 2014, p. 193). The structure of sourcing department and category management is shown in the Figure 7.



**Figure 7.** *Structure of sourcing department.*

The figure is a simplified version of how the structure can look like in real-life companies. Sourcing manager might be also in charge of one or two categories, on top of the general management of the team members. Depending on a profile of a company, whether it is a manufacturing or assembly (project) oriented company, the categories can include very various items. Firstly, all purchased materials and services can be classified into two categories: direct and indirect. The indirect category consists of materials and services that are not part of company's offering, but are crucial to deliver the end customer product. Those are maintenance, repair and operating materials. Also belonging to the indirect category are the outsourced services, subcontracted by a company for such activities like cleaning support or warehousing. Direct materials are more straightforward, physical items that end up as part of the final product. Such can be items like raw materials, components, semi-produced goods, and even fully finished trade products. (van Weele 2014, p. 15)

As each department, sourcing has certain responsibilities and tasks to perform. The most important activities sourcing oversees are presented in the Table 2.

**Table 2.** *Primary tasks and responsibilities of sourcing (adapted from Van Weele 2014, p. 53).*

Operational excellence	Cost control and cost reduction	Risk management	Continuous improvement
<ul style="list-style-type: none"> <li>• all supply needed is on time in short- and long-term</li> <li>• reliable suppliers of a consistent quality at appropriate cost</li> <li>• effective and efficient processes</li> </ul>	<ul style="list-style-type: none"> <li>• spend management: supply at lowest TCO or best value</li> <li>• indirect costs optimization</li> <li>• risk vs.- value evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• reduction of risk exposure</li> <li>• purchasing requirements communication</li> <li>• corporate social responsibility (CSR) execution</li> </ul>	<ul style="list-style-type: none"> <li>• development task</li> <li>• i.e. partnership with the suppliers in R&amp;D</li> </ul>

Operational excellence highlights the importance of the on-time supply provision, with good quality and reasonable costs. Effective processes in the sourcing department allow it to maintain its role as the primary purchasing function of the organization. In case the processes are not efficient enough, other parties involved in the supply chain within the company might start doing purchasing of their own and the transparency of processes disappears. The spend related management task is mainly taking care of the total cost of ownership (TCO) monitoring and optimizing the indirect costs. All sources of waste and material inefficiencies are to be minimized, which can be done by controlling the logistics and handling processes of the materials. This task is very crucial when thinking of the percentage of the purchases in the product cost structure. (Van Weele 2014, p. 53)

Despite some advantages of long-term relationships on an exclusive basis with some suppliers like reaching economies of scale, company's representatives should avoid being too dependent on few suppliers. Being able always to choose from the sources available in the market is crucial, as different factors are important at different times. The price itself is not a deciding factor anymore, as quality and the delivery times are contributing more to the company's value creation. To avoid misunderstandings about required technical specifications, those should be openly communicated to the suppliers. Especially when doing global sourcing, the CSR policies should be well established and monitored. As it has been mentioned earlier, suppliers have the benefit of innovating in their area of expertise. Hence, for the buying company they pose as a great source of more advanced solutions, which they could not provide themselves. Maintaining partnerships and continuously developing practices is a task of sourcing department not to be forgotten. (Van Weele 2014, p. 53)

## 2.2 Quality

To succeed in business, there should be a special factor that sets the company apart from the competitors. In today's global market, the amount of offering available for the customer to choose from is outstanding. (Summers 2010, p. 4) Goetsch and Davis (2010, p. 27) talk about how competitiveness increases based on the changing environment and the number of actors involved in business. The more companies there are to provide similar solutions, the higher competitiveness level there is in the market. Summers (2010, p. 4) remind that if the customers are not satisfied with the product, they will reach out somewhere else to fulfill their needs. One could argue that it all comes down to the brilliant idea that attracts the customers enough to make the purchase. However, the truth is, it is down to the level of operational excellence than can aid business into conforming with the three keys to success – being more time efficient, better, and bringing more cost savings than the competing companies. (Summers 2010, p.4) When it comes to maintaining quality, in great part it relies on how daily, typical and overall essential activities are carried out. As it is highlighted by Summers (2010, p. 4), consistency and continuity in improving those tasks are decisive factors in winning the market battle, as operational excellence is correlated with the outcome of doing things faster, better and cheaper.

### 2.2.1 Definition of quality

Quality is a concept that has its long roots in history. The existence of human ancestors was dependent on the quality of materials they had tools made from, to secure their living. With the development of civilization, the producing practices were handed down to respective generations. Professions started to get more advanced with the developing specialization techniques. Until then, the person responsible for quality was the artisan making the products. With the Industrial Revolution taking place at the turn of XIX century, there has been shift from hand production and craftsmanship to the usage of machine tools to fit for the mass production. The need for more standardized techniques occurred and the management had to come up with a way of how to define the quality of the material, working methods and technical specifications to control the manufacturing process. This marked the beginning of the quality regulation practice in the industries. (Sower 2011, p. 4)

Quality is a very complex and subjective term, changing from user to user. There are five approaches that can be used when defining quality presented by Garvin (1984; cited in Sower 2011, p. 10). The transcendent approach philosophically considers it as an elemental perfection. It is rather idealistic approach, but not very practical. In a product-based quality view, it is the fulfillment of the purpose of the product with the array of characteristics. Such view is determined by ISO 8402 (1990) standard. (Sower 2011, p. 10) More practical view is one highlighted by Goetsch and Davis (2010, p. 4), where the quality is considered to be “in the eye of the beholder”. That approach is called user-based

and the quality is reflected by fulfilling the requirements, which are set by the customer. (Sower 2011, p. 10) Posing as requirements could be technical specifications, measures or standards fitting a particular customer. (Garvin 1988a) Fourth approach is manufacturing-based and it indicates conforming technical requirements. It is most often used approach in a manufacturing companies. Conforming the requirements is an important step in delivering good quality, that is often not considered enough. As a matter of fact, product can fulfill technical requirements perfectly, but still not meet customer's requirements. (Sower 2011, p. 11) Moreover, Garvin (1988a) states that using only one approach can results in problems. Combination of user-based approach and manufacturing approach could result in delivery of better quality, as the specifications would originate from the customer's needs. Lastly, there is value-based approach. The quality is being measured by its costs. Meaning, the price of fulfilling the performance expectations has to be reasonable. Another way of approaching this is the cost of not conforming the requirements. This is seen as a supplementary approach to the manufacturing-based approach. (Sower 2011, p. 11) All the mentioned approaches are correct, but not comprehensive enough to secure satisfactory quality expectations. The quality perceived includes, besides the physical attributes, also the human resources and proceedings that support the product "consumption". (Goetsch and Davis 2010, p. 4) Hence, the broad-based approach was introduced, which can also be called total quality - encompassing quality that provides higher value to customers and is delivered in a consistent manner (Goetsch and Davis 2010, p. 6).

It is crucial to understand that quality is much more than the physical product itself. Sower (2011, p. 3) points out the common mistake of thinking, that the quality issues concern only the quality department in the company. In fact, quality assurance should involve everybody within the organization. The fields of design, procurement and production are prone to the occurrence of faults (Garvin 1988a). Moreover, the concept of quality process implementation is misunderstood by workers, thinking it can take place without affecting the company's already existing culture (Sower 2011, p. 3). This is a substantial obstacle when attempting to reform the quality assurance process in an organization. Therefore, for the purpose of this study the concept of total quality (TQ) is going to be reviewed and referred to. Having that said, the definition of total quality approach is...

*"...attempting to maximize the competitiveness of an organization through the continuous improvement of the quality of its products, services, people, processes and environment." (cited from Goetsch and Davis 2010, p. 7)*

W.E. Deming and his contribution to the understanding on how to improve quality is greatly valued all over the world. He reminded that it is better to replace and improve the system rather than blame the workers on poor quality performance. (Sower 2011, p. 13) Deming claimed that more than 80 percent of faults take place due to the overall system, rather than the employees (Sower 2011, p. 17). Hence, the reevaluated and reinstated process can bring four times the difference than change of workers. Another quality scene

revolutionary was Juran. He agreed with Deming about the system being the reason for faults taking place, but has a view that it is possible to fix the current system, rather than exchanging it with a completely new one. (Sower 2011, p. 17) Juran's concept is visualized in his Quality Trilogy, where quality is customer focused and settled on three pillars: measures, people and processes (Goetsch and Davies 2010, p. 6). Person who finally introduced the concept of TQ was A. Feigenbaum. The concept was supplemented and it evolved over the years by other research authors, but the core stayed the same. (Sower 2011, pp. 17-19)

The TQ concept differs from product quality by continuous improvement approach of products and processes. When the traditional quality approach handles failures only when they happen, the TQ focuses on improving the preventive actions. (Goetsch and Davies 2010, p. 9) There are eleven key elements of this concept, presented in the Table 3.



**Table 3.** Key elements of Total Quality (adapted from Goetsch and Davis 2010, pp. 10-12)

How is total quality achieved?	
<b>Strategically based</b>	strategic plan developed to achieve sustainable competitive advantage, includes: vision, mission, broad objectives and activities
<b>Customer focus</b>	customer in the driving seat, external customer defines the quality of the final product, internal customer defines quality of people processes and environment associated with the product
<b>Obsession with quality</b>	most importantly exceeding the expectations, personnel from all the levels ought to strive for more
<b>Scientific approach to decision making and problem solving</b>	collecting actual and measurable data to benchmark, monitor performance and improvement
<b>Long-term commitment</b>	TQ is an approach establishing a whole new company culture
<b>Teamwork</b>	competition brings great results, but it should be focused on increasing the external competitiveness rather than internal
<b>Continuous process improvement</b>	products are the outcome of the processes; therefore, the processes should be continuously improved
<b>Education and training</b>	continuous improvement of people
<b>Freedom through control</b>	freedom of solving problems within own scope of control, with well-planned monitoring
<b>Unity of purpose</b>	all employees work towards common goal
<b>Employee involvement and empowerment</b>	increases the input of the workers within their area gives them a voice that is being heard

What can be seen from Table 3, is that aiming for total quality is cross-functional and cross-organizational. The process involves long-term committed teamwork, with strategic objectives having in mind both, external and internal customers. Every process has two ends, meaning there are two customers involved, in-house (internal) and an outer one (external). The obsession with quality mentioned in the table, is interpreted in the way that all customer's expectations must be met and even exceeded. The commitment to quality should be monitored and continuously improved. As Goetsch and Davis (2010, p. 11) point out, everyone in the organization should be in their own "driving seat", when it comes to making decisions and problem solving. For that to be possible, a well-structured

system should be in place to support such practice. This way workers are more empowered in working towards a common goal. TQM must be an integral part of the day-to-day activities, in order to be used to its full potential. (Sower 2011, pp. 30-31) All this might seem extensive and complex, but in the end quality definition comes down to capability of providing great merits to all stakeholders involved (Karapetrovic, 2003; cited in Asif et al. 2009). Definition introduced by Karapetrovic (2003), departs from focusing only on customer satisfaction towards more realistic approach, where also other aspects of performance are taken into account. These aspects can be for instance, financial and operative. Van Weele (2014, p. 227) highlights the significant role procurement has in setting up a TQM system.

To sum up, the terminology used in this thesis work and some of the definitions and their distinction between each other will be introduced. As it was mentioned, the focus will be put on TQ and its management (TQM) in the long-term to satisfy the customers. Then there is quality management (QM), which encompasses two important functions: quality assurance (QA) and quality control (QC). Quality assurance is a process that covers the whole supply chain, when delivering the product, starting with suppliers and ending with the customers. It is a process of scheduled and standardized activities securing the desired quality of products. On the other hand, quality control is more operational and has its focal point set on minimizing any irregularities that can take place in the production line of the final product. (Sower 2011, p. 20)

### **2.2.2 Quality dimensions and their measurement**

As it was presented, quality is a complex term to describe. It evolves with new system standardizations, incentives to waste elimination and focus customer-orientation. (Summers 2010, p. 19) Not only can there be many definitions of quality, but also many dimensions it can consist of. The main division of the quality dimensions are for product and service quality. (Sower 2011, pp. 7-8) The focus of this research is in the product offering of the suppliers, so the quality dimensions discussed will not relate to the quality of service offering.

In 1987, Garvin developed a framework that aids product quality defining. It increases the management's understanding of quality. The value of the dimensions is especially valuable when making decisions on a strategic level. It means that a company can choose dimensions they want to be competitive at. (Sower 2011, pp. 35-37) The Garvin's eight dimensions presented are as follows (Sower 2011, p. 7):

- Performance
- Features
- Reliability
- Conformance
- Durability
- Serviceability
- Aesthetics
- Perceived Quality

To be able to compare the quality of the products based on dimensions, measures have to be developed (Sower 2011, p. 7, 35-37). For example, a steel beam is required to have certain tolerances to withstand its daily use on the final product. Its endurance rate could pose as a measure for the performance of the steel beam. Features could be the length of the beam. The dimension of reliability could be measured by the amount of properly manufactured beams in certain time period. Conformance is measured by level of fulfilling the technical requirements set by the customer. A dimension of durability could have a measure of expected lifetime of a component. Serviceability might be measured by competence needed or repair easiness to provide such beam. In the industrial world, aesthetics does not play as big role as in the consumer market, but at least continuity of coloring and shape is measured. Finally, perceived quality is the dimension that is different to each customer. When operationalizing quality dimensions, it is important to take into consideration the view of the key stakeholders. (Sower 2011, p. 7, 35-37) Hence, for example, serviceability could be measured by customer's satisfaction with the purchased product. That being said, there is no general values of the dimensions that should always be obtained. The dimensions are perceived subjectively by the parties involved, with some of them being more important than other. The costs of the extent of different dimensions also play a significant role in customer preferences. (Sower 2011, p. 7)

## **2.3 Supplier performance measurement and its improvement**

In the previous subchapter, the ways of defining the quality with Garvin's dimensions were discussed. This presented a brief introduction to the need of establishing supplier performance measurement system in the companies. The reason for that is that the value of the measures will not be satisfactory, if not controlled and supervised (Caniato et al. 2014).

Performance measurement allows setting targets, control and supervision of different activities within an organization (Cousins et al. 2008, pp. 241-242). However, there is a notion that the performance measurement mostly has been applied to the internal activi-

ties of a company. When trying to measure supplier's performance it consists of two organizations, the customer and the supplier, which implies the need for cross-organizational performance measures. (Cousins et al. 2008, p. 242) The effectiveness of performance measurement is assured when there is harmony between financial and non-financial measures (Gunasekaran et al. 2004, p. 335).

As it was stated, the responsibility of supplier evaluation and contract follow-up belongs to sourcing (van Weele 2014, p. 98; Cousins et al. 2008, p. 242). Most often suppliers are being measured by the sourcing representatives by the criteria of price and quality (Caniato et al. 2014; Araújo et al. 2017). Having supplier performance measurement in place allows to clearly communicate to the supplier, which aspects of their performance matters to the buying company the most. Moreover, this also helps to address the continuous improvement initiatives. (Cousins et al. 2008, p. 242) Venegas and Ventura (2018) identify two ways of supplier continuous improvement. One way is to simply have procurement educate themselves more about the capabilities of the suppliers by, for example, visiting workshop areas and performing audits. Second way is to perform trainings for the supplier and assigning responsible person from the buying company to conduct improvement activities in the supplier's technical aspects and proceedings. (Venegas and Ventura 2018)

### **2.3.1 Quality in sourcing**

Sourcing function is responsible for purchasing the supply. There are two approaches to purchasing, former being transaction-, and latter- relationship-oriented (Axelsson and Wynstra 2002, p. 213). The former approach is more classical version of purchasing, where the business deal's perks are considered only in short-term. Deciding criteria in such transactions is the price of items. The relationship-oriented approach, on the other hand, focuses more on the value a relationship between a seller and the buyer can bring in the long-term. Hence, relationship-orientation considers the TCO of the supply and new value creation far more important criteria than the single price. (Axelsson and Wynstra 2002, pp. 213-214)

When establishing such long-term relationships with the suppliers, the value they bring is to be evaluated. Lambropoulos (2007) highlights that completing customer projects successfully should be done within pre-established time, cost and quality requirements. To assure successful project completion, performance measurement is to be used to control and monitor the mentioned criteria (Cousins et al. 2008, pp. 241-242). The quality especially cannot be compromised or negotiated (Lambropoulos 2007). Jiang et al. (2016) highlight the importance of monitoring the quality in B2B transactions. Quality itself does not cost money, but its lack does (van Weele 2014, p. 225). Every industrial company when receiving goods must make inspection for possible faults. Time spent on those activities, as well as troubleshooting the occurred quality deficiency problems can end up costing a substantial amount of money. Quality related tasks are recognized to arise in all

of the responsibility areas (from Table 2) of the sourcing department. (Jiang et al. 2016) On top of quality assurance and control, a continuous improvement approach is crucial. It aims to develop better processes to support those duties. (Sower 2011, p. 17) As Rose (2005, pp. 69-70) highlights, improvement processes are essential to company's comparativeness and contentment with the product. Hence, the monitoring of quality does not end with the quality control, but requires gathering feedback in form of data (Rose 2005, p. 41).

### **2.3.2 Supplier quality process**

It has been highlighted in the literature that suppliers have a direct effect on the customer company's final product if their parts are included in the assembly. For example, elements as the cost, technology, quality and delivery of the final product are highly dependent on the suppliers input. (Krause and Scannell 2002) When certain suppliers pass the capability test, the supplier quality control process takes place.

The process starts with determining the technical specifications. It can be done in two ways, either a customer first determines the specifications or the supplier does. If a customer is the one releasing the listed needs of the product, it must be ensured that they include everything the customer wants. Then, the supplier must be properly informed so he or she understands what is required of them. When the supplier is the one giving the set of specifications they manufacture the products by, the customer must review them and confirm it covers everything needed and that the qualities are being understood. It has been mentioned in the previous paragraph that a document including crucial component features is given to the suppliers for them to manufacture accordingly. However, what is also important is to let the supplier know how the components will be tested and controlled. Specifications are coming from the technical engineers. Tests and controls are performed together with quality engineers. (Grocock 1974, pp. 115-117)

Despite arranging all the initial assessments and controls, the companies still find themselves in want of further improvements in the mentioned areas: cost, quality and delivery. (Lewis 1998; Morgan 1993) These being just some of the examples. Moreover, there is a worry that the capabilities of the suppliers to fulfill the requirements in the future are not going to be enough without customer constant interfering. That has lead to the need of developing a measurement system of the supplier's performance. (Krause and Scannell 2002) As much as it is duty of production to manufacture the components in conformance with the technical specifications, it is also the duty of procurement to purchase goods that fulfill those requirements. Hence, performance measurement process involves procurement department. To assure good quality components cannot be sourced based only on the best delivery times or the cheapest price. It is deeply emphasized that quality control does not exist without cooperation of procurement, technical engineers and quality department. Company's increased satisfaction with the supplier's performance is primarily

dependent on the work of procurement. What is more, it is mentioned that it is the procurement function which should empower and motivate other departments for delivering full technical specifications and conducting own quality controls. The way other departments operate, affects greatly the sourcing activities. (Grocock 1974, pp. 115-117)

### **2.3.3 Supplier performance quality measurement**

As it was mentioned, the implementation of TQM in big part lies in responsibilities of procurement (van Weele 2014, p. 227). Procurement team has specific policies to follow when it comes to securing good quality. Supplier quality measurement starts with clearly stating who is in charge for supplier quality within organizational structure. The quality guidelines are not enough if there is no one to execute them. When the roles are established, then the activities must be determined. Simply stating that quality of suppliers is good is not sufficient, but the actual data to support such statements should be provided. (van Weele 2014, pp. 231-232)

Supplier quality measurement should consist of key performance indicators (KPIs) assigned to critical processes, which would visualize their current state. As an example, there could be a goal for maximum rejection percentage of component categories or percentage per supplier. When it comes to claiming, a text book KPI could be average time for claim processing per purchaser. (van Weele 2014, p. 232) Moreover van Weele (2014, p. 233) states, that because purchasing and sourcing departments are the final step present in making the selection of the suppliers, they should be held accountable for the quality delivered as well. Hence, purchaser's and sourcing's work should be measured by the mentioned KPIs in order to monitor quality levels. Lastly, securing good quality does not happen without proper feedback. It makes a significant difference, when the supplier is notified about possible challenges or issues that arise. (van Weele 2014, p. (233))

However, the reality is not as perfect as the textbooks say. Jääskeläinen and Thitz (2018) highlight in their research, that the communication of the performance measurement data is not systematic enough, despite having different occasions like supplier meetings to discuss the issues. Every company wants to know how their performance has been received by the clients. E-mailing and calling is very traditional form of doing so, but professionally it should be done through report analysis and letting the numbers to speak for themselves. (van Weele 2014, p. 233) The lack of systematic way of informing about deficiencies in the supplier offering results in performance data being communicated only internally. Such approach does not support improvement in the supplier performance. Customer companies inform the suppliers about possible non-conformances with the desired quality or delivery issues, when they take place, but not in a systematic way. Furthermore, this communication is often one-way, meaning the purchaser informing the supplier and not presenting the opportunity to open the discussion more. (Jääskeläinen and Thitz 2018) The KPIs are very valid tool to inform about the performance of the suppliers (van Weele 2014, p. 233).

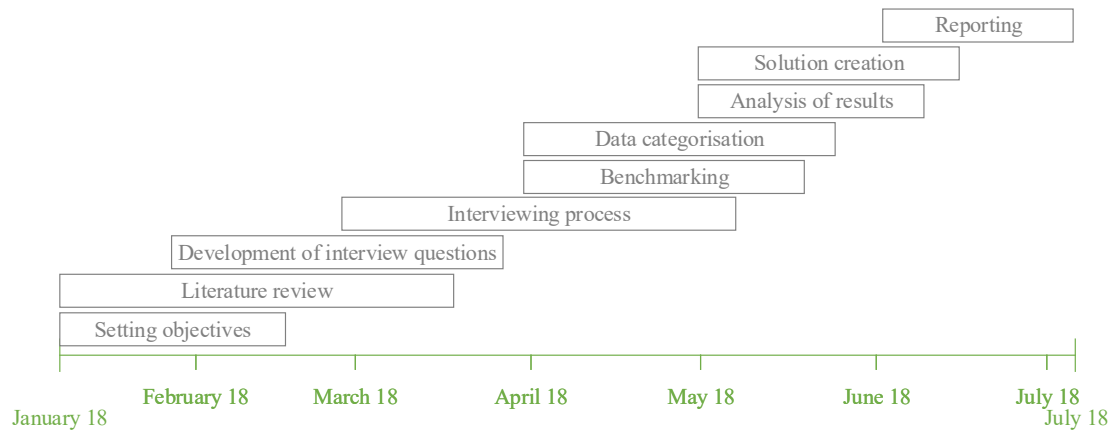
Van Weele (2014, p. 233) states, the gathering of such data is not always as easy due to information being scattered within company in various systems. The quality of the offering provided by the supplier can be measured by certain criteria (Garvin 1988b). For example, when ordering a product from an on-line store, the consumers can measure the service by such criteria as:

- Offering range
- Immediate availability
- On-line customer service
- Speed of delivery
- Return policy
- Intuitiveness of the website
- Physical quality of the product
- Price

Worth noticing is that this approach is suitable for incremental innovations, taking place in already existing markets. When designing a radical innovation, the process is more complex, as the customer is not aware what requirements he or she should have to need this product. (Garvin 1988b) Here the quality is being measured based on its conformance at the adequate cost. Hence, the higher the cost of quality, the higher gets the spending for the nonconformance with the requirements. (van Weele 2014, p. 227) In the example of on-line product ordering, it is seen that the criteria perceived by a customer exceeds the physical attributes of the item. Things like speed of delivery and responsiveness of the suppliers are also highly valued as well, when determining if an offering is of good quality. Choosing a supplier involves a vast range of activities rather than just simply looking through supplier's price lists. Nowadays, multicriteria decision making approach is more common and inherent for company's effectiveness. (Ho et al. 2010)

### 3. RESEARCH METHODOLOGY AND DATA

This research process consisted of nine steps, that spanned throughout January to July of 2018. The research steps are presented in the Figure 8.



**Figure 8.** *The steps of the research process.*

The first step was setting the objectives for the research, which are presented in the subchapter 1.3. Since the research was made for the request of case company and had rather changing nature, the objectives changed a bit over time. Second step was the literature review of the existing approaches to the topic. Based on the objectives and the literature review, the interview questions were developed. More about the interview structure formulation process will be explained later. After that extensive interviews started to take place. The benchmark of other companies quickly followed. When the data was collected, it was transcribed and categorized to allow a thorough analysis. The seventh step was the analysis of the results from the interviews, both internal and benchmark. When that was complete, the creation process of the solution began. Finally, the last month of the research process consisted of reporting all the outcomes of the study. The methodology of the research will be explained next.

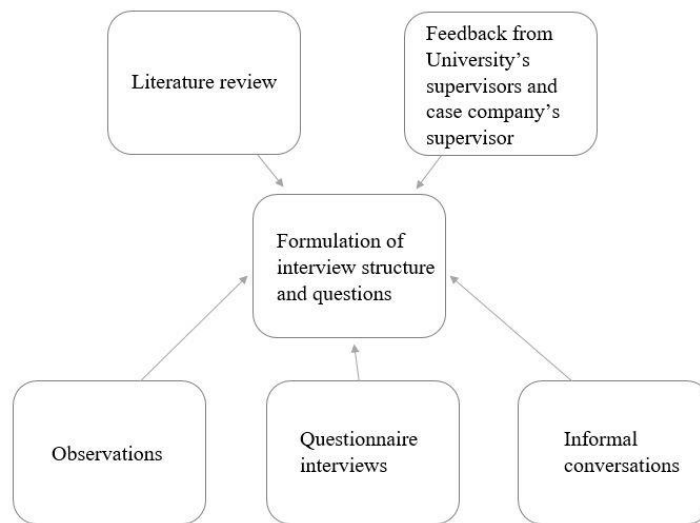
As it was already mentioned in subchapter 1.4, a case study was adopted as a strategy of this research. Valmet Automation Oy is the case company in question, but also other business lines have been chosen for the benchmark purposes. Nevertheless, this thesis work is based on a single case study. As research methods, multi methods were chosen, due to analyzing both, primary and secondary data, which are presented in the Table 4.



**Table 4.** *Data types of the thesis.*

	Primary data	Secondary data
Data source	Questionnaire interviews with survey elements	Books, Journals, Articles, Case company's internal database
Gathering methods	Semi-structured interviews Three questions based on scoring (1-10)	Collecting, reading through, categorizing, filtering

Primary data has been collected through semi-structured interviews and three survey questions based on scoring presented in the beginning of the interview. Semi-structured interviews allow to follow themes and questions set beforehand, but depending on the interviewee and the flow of the conversation, they may be changed or skipped (Saunders et al. 2009, p. 320). In its majority, primary data gathered consists of qualitative data, as the aim was to understand the current processes and opinions behind them (Saunders et al. 2009, p. 324). The interview questions were designed in most part in an open-ended way, so unplanned topics could arise to the surface if needed. The formulation of the face-to-face interview structure was a thorough process of choosing and altering the right questions for the research topic. The influences on the interview questions and its structure are presented in the Figure 9.

**Figure 9.** *Interview structure formulation process.*

The interview questions were influenced by the literature review conducted in the beginning of the research, observations done within the case company, as well as questionnaire interviews and informal conversations with company employees. Also, the feedback received from the University professors monitoring the process of this thesis work was considered, together with the comments from thesis supervisor within the company. After couple of rounds of feedback and observations, the questions were improved and altered accordingly to the interview focus group (case company's representatives, other business

lines' representatives and other companies' representatives). The respondents were grouped into three categories. First, internal category consists of Valmet Automation's stakeholders. Second category considers the other three business lines' representatives, from Valmet Technologies. Finally, the third category represents participants from other companies than Valmet corporation. Two latter categories were created for the purpose of benchmarking and are marked with bolded font. The respondents were chosen based on the relevancy with the researched topic and their job description. The interviewees are shown in the Table 5.

**Table 5.** *List of interviews within Valmet company.*

	<b>Business line</b>	<b>Position</b>	<b>Duration (min)</b>
Case company / Internal	Automation	Category Manager A	91
	Automation	Category Manager B	83
	Automation	Category Manager C	81
	Automation	Purchasing Manager	45
	Automation	Quality Manager	65
	Automation	Project Quality Manager	69
	Automation	Supply Chain Engineer	52
	Automation	Production Planner	50
	Automation	HSE Manager	50
Valmet Technologies	Services	Director of Supply Chain, Procurement	39
	Pulp and Energy	Director of Category Management	75
	Paper	Director of Supply Quality	84
Valmet Corporation	-	Vice-President of Global Procurement	65
	-	Global Quality Manager	65

The interviewees represent four different functions: procurement, production, quality and HSE. In overall, in 2018 there were nine interviews conducted internally in Valmet Automation and for the benchmarking purposes - three interviews in Valmet Technologies and one interview at Valmet corporate level. Valmet Oyj operates based on a global business matrix organization. Besides four business lines (Services, Pulp and Energy, Paper and Automation) in five geographical locations (North and South America, EMEA, Asia-Pacific and China), there are four corporate functions: Finance, Strategy and Operational Development, Human Resources and Marketing and Communications. (Flow, 2018c) Two of the interviews were conducted with representatives of the Strategy and Opera-

tional Development function. One of the participants leads the Global Procurement network. The second person is part of Global Quality network. Also, two external companies were benchmarked and are presented in Table 6.

**Table 6.** *List of benchmarking interviews at external companies.*

Industry	Position	Duration (min)
Metal	Sourcing Manager	85
Nuclear power	Procurement Manager	-

All the interviews were conducted on one-to-one basis, excluding two. They were documented by taking notes and recording audio files. The interview with the category manager A was conducted with two guest participants, which prolonged the duration of the conversation. Also, the interview with the corporate representatives were held commonly. The first benchmarking interview done outside of Valmet circles was done through e-mail exchange, which explains lack of the duration time in the column in Table 6. The second one was done at the company's site. Most of the interviews were held in English, but some were in Finnish language. The analysis process of the interview data included transcribing and translating the key parts of the received information. Saunders et al. (2009, p.492) mentions categorization method for the analysis purposes, where categories are created and related data attached to them. The categories were chosen based on the research questions. To make the interview data more transparent and comparable amongst respondents, the framework method has been used. The method was developed in 1980s for social research purposes, but was found equally helpful for other reasons as well. (Smith and Firth 2011, p.52) As it is mentioned in the source, the method supports maintaining qualitative data in systematic way and makes analyzing easier. Table 7 presents the codes developed for mapping the data from the interview.

**Table 7.** *Codes used for interview data classification.*

Code	Description
Quality dimensions	Perception of which quality dimensions are valid for the case company and what do they stand for
Information needs within supply chain	Application purposes of the information about quality
Information needs from sourcing point of view	Utilization of the information about quality when working with the suppliers
Quality measures	Current KPIs applicable to supplier quality
Influence of quality	Influence of quality issues on work activities; which tasks concern quality
Improvement ideas and welcomed changes	Supplier measurement ideas and wishes towards future

Having the codes determined and information classified accordingly helped analyzing the results in a construct way. The current state analysis and all the process steps and the gaps were identified through this method. The interview questions are attached as the appendix B in the end of this work.

The secondary data has been mostly gathered from existing materials to deepen the understanding about case company's internal processes. Different sources of such data have been used to ensure the consistency and conformance of the research. Secondary data has been a solid base to start the research for this thesis, as well as crosscheck latter findings along the research process. Both types of data allowed to answer the research objectives set. Hence, the focus of data collection is put on multi method qualitative studies.

To sum up, for the purpose of this thesis the research questions were set first. Then the literature review allowed to brief into the existing theories and practices. Thirdly, data gathered from single case study was analyzed to test the theory. Lastly, vast conclusions are presented with the results discussed and linked with literature findings.

## 4. EMPIRICAL ANALYSIS AND RESULTS

### 4.1 Sourcing department of the case company

This research focused mainly on the sourcing department of Valmet AUT. Before presenting the analysis of the interview data, portrayal of the department is going to be presented.

AUT Sourcing department is accountable for the external sourcing of all AUT product lines on a global scale. Sourcing work is done in collaboration with the logistics, projects, sales and RTD (research and technical development) departments. All purchases are being made according to the current laws and regulations in the country of operation. Valmet has own HSEQ policies and ethical guidelines that should be followed. The purchases are conducted cost-efficiently with the use of valid supplier contracts and RFQ (request for quotation). Sourcing team in collaboration with other departments ensure that purchased products and services are in-line with technical specifications and possible certificates (REACH, RoHS – Restriction of Hazardous Substances Directive). (Notes 2016)

The structure of sourcing department at Valmet AUT is similar to the one presented in the theory chapter by van Weele (2014). The role of leading AUT sourcing manager is held by the Head of Global Procurement, who leads three supply centers (SC) (Tampere SC, Kajaani SC and Gliwice SC in Poland). There are five category managers underneath. Together they handle seven different categories. The team has the responsibility of strategic and tactical management of spend categories. They take part in category strategy process, as well as demand-supply management activities. Sourcing and supplier database maintenance is one of the team's main task. Their role stated in the company's description is also to empower the purchasing team (team that handles the operative side of buying). (Notes 2016) Purchasing team in the company has more operative tasks, same as van Weele's order function. The structure is presented in the Figure 10.



**Figure 10.** *Structure of Valmet Automation Sourcing Team in Finland.*

In the figure, there are seven categories distinguished and respective category managers in charge of them. The team uses the Category Management model when distributing tasks and responsibilities, which are as following (Notes 2018):

- global sourcing
- project sourcing
- production sourcing
- supply chain development
- category management at AUT business line level
- support to category management at Valmet level.

Head of the Global Category Management oversees development and maintenance of the Category Management model. At Valmet level, the tasks of the team are to keep track of obtaining the strategic Must-Wins, based on analysis defining the benefits of having unified working network and utilizing the Valmet's volume advantages. The team prepares annual and global contracts with the approved suppliers, harmonizes the key processes and tools and sets constructive KPIs. Performing benchmarking and exchanging experiences, as well as best practices are also part of sourcing team's activities. (Notes 2018)

Project procurement happens in a collaboration of project team and sourcing. Project team takes care of laying out the sourcing plan, technical specifications, the scope of the project and sales prices. Sourcing on the other hand, sends out RFQs to possible suppliers and maintains the dialogue with the suppliers. After receiving RFQs they submit them. Both, project and sourcing teams plan together the schedule and select initially the considerable suppliers for the work. Both, project team and sourcing decide of the final supplier for the project. Project team is responsible for the technical part and scoping the quotations, whereas sourcing team handles the commercial part and possible request for corrections for the suppliers. The purchase proposal comes from the project to the sourcing managers to execute the contracts. The purchasing team makes the operative actions of sending orders to the suppliers. The deliveries are being monitored by project team (in design matters), logistics coordinator (assemblies) and purchasing team. The latter focuses mainly on the delivery times and informing the project in case of delays. (Notes 2018)

In Valmet AUT suppliers are the main responsibility of the Category Managers. Since 2016 all the suppliers must be opened and maintained in CoMPass system. This way the master data management is much more efficient, as well as it gives transparency to the purchasing activities. Category Manager checks supplier's background, credit history, competitors, values related to ethic and environment and their capability of supplying at demanded quality. After evaluation, potential supplier's basic data is inputted to CoM-Pass. The sustainability team steps in and does a background check and sustainability evaluation. Suppliers assess themselves as well, following the sustainability policy provided by Valmet. Having all that information gathered, an Assessment lead and a team for the main part of Supplier Assessment process is appointed. A plan is developed for reviewing the supplier's activities and procedures. After execution of the plan, follow-up actions take place to check if ordered corrective actions have been executed. Finally, the results are reviewed and the supplier status is decided. Statuses can be checked from

CoMPass system and they can be as following: approved, temporary approved or potential supplier. Suppliers that have been approved are audited regularly according to the Valmet Quality Auditing procedures. Audits focus on process and product quality and its outcomes are graded depending on their scale. Category 1 and 2 are, respectively, major and minor nonconformities. Category 1 marks significant lack of system elements, which indicates possible breakdown or not meeting specified requirements. Category 2 issues do not indicate doubts if the product will meet the needed requirements. However, these nonconformities if taking place continuously can turn into category 1. Third outcome of auditing are observations, which are not non-conformities yet but might lead to them if corrective actions are not taken. Lastly, opportunities of improvement are highlighted. These are areas where the minimum requirements are fulfilled but could be done better. After audit, outstanding best practices that have been already in place are praised upon. This helps raising morals of the suppliers and shows the direction all the processes should be leading to. External audits are also conducted to test the conformity with the ISO 9001 and ISO 14001 standards. In Valmet company, there are internal audits that aim to improve performance and competitiveness of operations. Requirements of ISO 9001:2015 are currently applied. This supports continuous development of the business line and opens a dialogue for sharing best practices. Compliance with other AUT certificates is tested. (Notes 2018)

Supplier management is under continuous development and interaction with the key suppliers takes place on a regular basis. Sourcing managers take care of contracts and price lists, categorizations, meetings with the suppliers, setting targets and KPIs with them, follow-ups, preparing forecasting and processing feedback. Category-oriented supplier management involves maintenance of purchase operations conditions, category price lists and assignment of responsible person for them, assuring all the needed practices. Category managers follow the spend reports and OTD. Suppliers are measured with such commercial KPIs as price, quality (number of claims made), payment terms, delivery terms and on-time delivery percentage. (Notes 2018)

Every month the sourcing team releases a Procurement Update report. It contains set of KPIs, which allows monitoring the current state of the sourcing activities (Notes 2018):

- Direct spend
- Procurement savings (project savings and component savings)
- DTC (Design to Cost) share of savings
- CCC purchases share
- Supplier OTD
- Average payment term

What can be seen from the presented list of KPIs used by the sourcing team, is that none of them measure supplier quality. Further analysis will aim to determine if what is stated in the official handbooks stands true in practice.

## 4.2 Quality in sourcing

Before diving into the topic of quality measures and processes, the general understanding of supplier quality was investigated. Defining the quality in sourcing is one of the sub-questions for this research. The purpose was to get the respondents to formulate on their own what they considered being part of supplier quality. Each interview sheet had Garvin's quality dimensions written in the upper section, for the interviewee to look upon freely. The answers varied in their formulation, but the meaning was somewhat similar as in the case of *according to the design*, which meant conformance with the technical specifications given and meeting company's performance requirements. The most common answers are presented in the Table 8.

**Table 8.** *Quality factors determined by the case company's respondents.*

Quality Factors							
	Working as expected	Error-free-ness	On-time delivery	Conformance to specifications	Consistency of quality	Traceability	Supplier's cooperation skills
<b>Answers number</b>	5	1	9	8	3	4	3

From the table it can be seen, that on-time delivery and according to the design were quoted the most. On-time delivery means receiving the order within agreed time frame, in the right quantity and to the correct place. The latter factor, as stated previously, determines the fulfillment of the technical requirements. As further analysis will unveil, those two factors constituting for quality are the most troublesome to the company. The on-time delivery especially, is one of the biggest issue Valmet AUT must tackle daily. The delivery influences many departments involved in project delivery to the customer. Quality Manager highlighted:

*"Suppliers must be keeping the schedules. Good quality is not enough if the products are late."*

Valmet AUT has two types of products that it sources: 3<sup>rd</sup> party products (supplier's own components) and Valmet design products. The latter type is manufactured by a supplier based on design and documentation Valmet AUT provides them. Having the product done according to the design should secure its proper functioning. Commonly mentioned factor as separate one from the design conformance was that products should be working as expected. This could be a bit broader take on the design conformance, and was usually stated by interviewees who do not have much direct contact with technical side of the products. Hence, it resumes as separate factor. Project Quality Manager summarized all the other statements shortly:

*"Working as expected, it's black or white."*



Some of the determinants were more interviewee specific, based on the position they hold as, for example, the purchaser considered the on-time confirmation of orders from the supplier to be most crucial. This was pinned under the supplier's cooperation skills. That also means supplier's ability to propose their own solutions, for instance, different component supplements and initiate improvement processes on their own.

Naturally, the quality of manufacturing was discussed as having direct influence on the sourced components. Also, serviceability of the products was mentioned as an added plus. Consistency of quality as such was discussed, but mostly in more detailed approach than on general level. Hence, despite keeping the quality consistent received less mentions than others, it does not mean that relevance of continuous process is lower than other factors.

Traceability of the products and its components was identified very crucial since it allows tracking down the possible faulty batches and eliminating them from customers sites, own workshop areas and at supplier sites. If the supplier does not have a tracking system in place, purchasing from them would not be possible.

Due to having production capacity fully booked and the fact the testing of the Valmet's final product is very crucial quality check, which to be done thoroughly requires substantial amount of time, the error-freeness was mentioned as another quality factor. Quality Manager said:

*"Error-freeness is most important, not 50% but 100% of products must be error-free."*

In the interviews, it was asked how customer perception of quality looks like for the AUT products. All interviewees agreed that the customer has very similar quality perception as the company representatives. In the end, the reason why company has certain requirements is that the customers of them require the same. Quality Manager summed it up in few sentences:

*"We purchase components and deliver solutions. Solution is expected to be functioning and within the requirements. Error-freeness is a must, as we have a lot of quality tests and controls anyways, so we need to be able to trust the supplier's that the products are on point. Our customers evaluate our delivery."*

In conclusion, it is worth noticing that Valmet AUT is sourcing products, not solutions. Hence, error-free products that meet company's requirements and performance needs, are on-time, as well as are clearly marked for traceability purposes have been determined as the quality factors at AUT.

### 4.3 Current state analysis of the case company

This subchapter will review the current state of supplier quality approach in Valmet AUT and the challenges different workers face. In the internal databases, there are different quality guidebooks and procedures that confirm that topic of supplier quality is being approached. The interview questions aimed to determine the reality of the approach, practices taken and relationship AUT has with its suppliers. Most commonly brought up example of approaching supplier quality in practice revealed to be auditing the suppliers, arranging follow-ups and testing. Most of the interviewees agreed on the following thing: the official procedures, quality control and assurance techniques are existent but the practice is not so ideal. As Quality Manager pointed out:

*“We have certain practices in place, but we could be more systematic from the beginning of the chain.”*

As it was pointed out, the precision of what to test from starting point to the end is not clear and the respondent himself was not sure of what is being tested in practice. Moreover, as Project Quality Manager added:

*“Targets are set but not executed.”*

The substantial number of respondents have noticed that the existing company culture considers quality to be only supplier's responsibility. By having that said, it does not mean that this is the official approach, however it is the approach in practice. For example, Category Manager said:

*“We are requiring good quality but not telling suppliers how to do it. Documents provided for testing are not good enough.”*

The issue with the company's documentation that is provided to the suppliers turned out to have long roots. When needing to make changes in the product designs, Valmet AUT was notifying the suppliers about the alterations by, for instance, calling or arranging face-to-face meetings. For long time, the suppliers were the one to keep track of changes being made and AUT was content with the quality it was receiving. However, the difficulties started to arise when the sourcing activities were channeled to search for other suppliers to improve cost efficiency. In that moment, the documentation existing in the AUT files proved to be insufficient for the suppliers to deliver what was asked for. Moreover, from the sourcing point of view the documentation provided is important to begin conversation with the suppliers. One of the Category Managers pointed out:

*“The product's specifications and testing requirements should come from our R&D. But we don't always get all the needed information.”*

Another Category Manager indicated that in his category the documentation of products is scattered all over the place. There is no consistent alignment in storing the information. When the components arrive to the reception, after basic check they are collected by projects and delivered to the workshop area. Then the quality is being evaluated there. Reporting defects of the components is being made through supplier claims. They are discussed in supplier monthly meetings and more often if urgent. However, the current claiming process is not straightforward enough as most of the respondents mentioned. Quality Manager indicated:

*“After sending a claim, we require an analysis of root cause and corrective and immediate actions to be taken. However, I am not sure how do we follow that. Is claim being made when the problem is more repetitious from same supplier? Or earlier? How systematic are we?”*

Moreover, it was noted that when discussing the claims, there is always mention of supplier claims. There is the tendency when seeing or hearing the word “supplier”, people in the organization immediately think it is procurement department related responsibility. However, significant percentage of claimed faults were internally caused by, for example, not giving complete documentation to the suppliers. Respondents have mentioned that typically starting point was always blaming the supplier rather than investigating internally first. The process of claiming should be redefined. One of the Category Manager stated:

*“Process is there, instructions are there, but process is blurred towards the end. When we receive a response from the supplier, who should take the lead? Who should be judging if the actions taken at supplier side are enough?”*

Not only is the claiming process blurred, but also the form itself was indicated as needing simplification and clarity in describing the fault and assigning the responsibilities. The Category Manager confirmed that current claiming system requires category management to forward many e-mails back and forth between the Valmet AUT responsible and suppliers. This was considered as not the most efficient way to keep the key stakeholders informed when issues with the supplier quality were arising.

Issues with traceability of the sourced components also arose multiple times when interviewing. Manager of one category specified the quality of the components from their suppliers being generally good but traceability process of the material sources is often not at the desired level. It was mentioned that the suppliers have the traceability processes in place, but not accurate enough to always detect the sub-batch of the batch and its sources. He revealed:

*“One of the traceability problem is when we ask afterwards more special requirements to track our products. Supplier ends up with two differently marked batches of same product for us and we can never be 100% sure from which batch is the certain component.”*

So far, it proved to be more cost-efficient to have only some number of products tracked closely due to the extra costs. In future, company wants to mark the products as far in the process as it will still be beneficial. The upcoming system changes and taking in use QR codes are expected to be solution to the traceability problem. QR codes would replace the bar codes, as they can store more information behind one scan, whereas bar code can only store the single series number.

In conclusion, current supplier quality approach includes activities as following: supplier auditing, following up, delivering samples for testing and checking the reports. However, those were depicted as not systematic enough at the moment. Also, delivering good quality is still thought to be only the responsibility of the supplier. It was revealed that there are information gaps between procurement and R&D, as well as procurement and the suppliers. Both, procurement and the suppliers need to receive sufficient documentation in time in order to fulfill the performance requirements. The claiming system needs redesigning, to assure the faults being properly recorded and to support both, Valmet AUT and the suppliers in improving their processes.

#### **4.3.1 Information needs of quality within supply chain**

The following section will dispute about the information related to quality needed by AUT from the suppliers and vice versa. The information needed by the case company is going to be discussed, as well as what the suppliers need, in order to deliver what was asked for.

Doing business starts and ends with customers. They are the one to determine what are their expectations towards the products and so, the specifications are adjusted to those expectations. The customer often asks how does Valmet AUT assure good quality of its products. The customer is interested in the company's supply chain, which requires the company to be interested in their supplier supply chain as well. Quality Manager highlighted:

*“Even though the sourced products are manufactured somewhere else, it is important to understand how they are manufactured and tested. If we successfully go through customer manufacturing and testing requirements, it increases the quality.”*

It was mentioned in 4.1 that there are two types of products being sourced. In the case of 3<sup>rd</sup> party products, the R&D sets parameters for their functionality, as AUT needs to know if product is working according to the specifications. Valmet design products are more likely to have quality problems as it is not supplier's own product. The manufacturing orders are small and AUT in those circumstances is the only customer of that certain product for the supplier. Moreover, it was brought up that the specifications given to the suppliers are not necessarily complete. Hence, for the suppliers it is difficult to make the

product according to company's expectations, when what is expected is not being communicated well.

Not only the origin of sourced product ought to be known, but also the sustainability approach of the suppliers was marked as urgent matter. Different legal matters and requirements are also essential to follow as they can have big impact on the company business. This area was depicted as needing improvements. For example, in the case of RoHS (Restriction of Hazardous Substances Directive) directive HSE Manager portrayed:

*"We get information too late about directives, some of which we find out about when already sending our shipments. Sometimes it happened that the information was coming from some of our competitors."*

It would be convenient to receive information from the suppliers, like in the case of RoHS, if the products are compliant. Things such as transportation of ordered items and their packaging style also have an impact on the quality. Of course, the suppliers should fulfill minimum standards. However, it is important that AUT gives specific packing requirements if needed. Very essential information are the production sizes, if the suppliers can deliver asked quantities. In contract negotiation, standard condition is the delivery time. The density of the deliveries affects directly, for instance, the job of Supply Chain Engineer in production planning. The basis for good quality is not only well-negotiated contract, but also its alignment with the ERP system used by other teams within the company. It has been found out that this area needs more thorough attention and consistency, as the Supply Chain Engineer noticed:

*"Just recently, in some cases, the delivery time was found lacking from the system and it is a critical thing."*

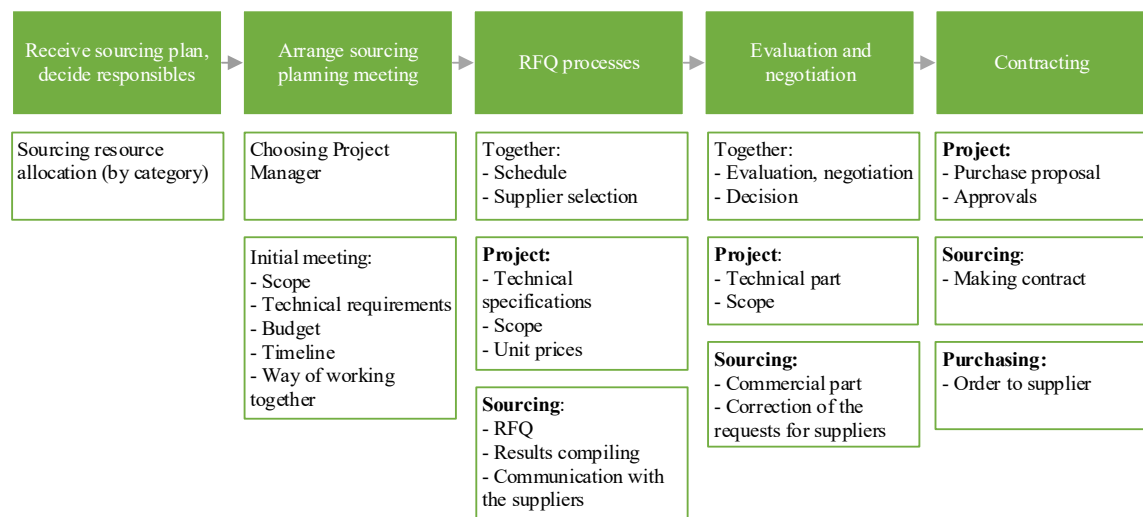
In conclusion, knowing the supply chain of the suppliers is essential. The source of the components, materials certificates, testing reports and supplier's capacity are needed to assure good quality. For the sustainability reasons, the manufacturing environment and techniques are ought to be known. Furthermore, when doing global business, all the economic, political and legal matters should be followed closely as they impact Valmet AUT greatly. Lastly, aligning the information in the system with the contracts made with the suppliers must be thorough enough, so the teams involved in delivering projects can work efficiently.

#### **4.3.2 Information needs of quality in sourcing**

Having quality in industrial processes defined as meeting company's requirements and performance needs, being delivered on-time and having clean traceability, the time has come to evaluate the information most needed from the sourcing point of view. One of the Category Managers portrayed the steps of sourcing as followed:

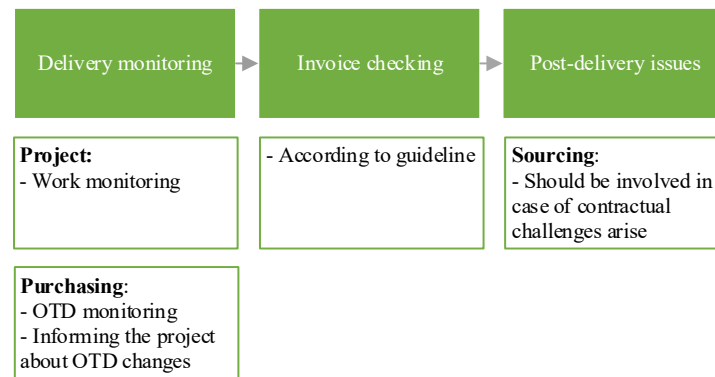
*“When we deal with a new supplier, we need to know from our Valmet contacts what we buy and how much. Then we ask for quality requirements, what specifications should the product fulfill. Specifications and testing documents are needed to assure desired quality of components.”*

It was mentioned that the cooperation between R&D department and sourcing is not always working. For the category managers, it is crucial to have complete documentation with technical requirements that suppliers can understand. The problem with documentation is twofold. First, it tends to be scattered around, as not all the testing reports are inserted in database with documentation. Second, some of the designs and their updates are entirely missing from internal databases as the information was stored at the suppliers, which no longer serve the company. Good quality comes from the two parties working together towards common goal. There is information that the company needs to receive from the supplier to assure needed level of quality. However, it also requires the company to provide its suppliers with complete information about those desired levels. In the Figure 11 is presented the information needed at each step of the sourcing process.



**Figure 11.** Sourcing process in AUT (adapted from Notes 2018)

The ability of the supplier to fulfill the demand of Valmet AUT is one of the most essential things that is asked from the supplier, but cannot be done without the specifications and the documentation. Hence, availability of this information and its completeness is critical. If the supplier product quality does not live up to the standard, sourcing department needs detailed information about what has been received and what has been asked for. Only then, a claim can be made to report non-conformance. Those are being checked in monthly meetings with suppliers and even more often, if the case is urgent. Post-contracting process in AUT involves delivery monitoring, invoice checking and all issues that might arise post-delivery. The process is visualized in the Figure 12.



**Figure 12.** Process after contracting in AUT (adapted from Notes 2018).

Last step in the post-contracting process are post-delivery issues. Those are usually warranty and reclamation cases. These came across in the interviews very often. Recording number of claims made can pose as very informative measure for the category managers when evaluating the performance and discussing it with the suppliers. However, in all the categories claims are not being made consistently. This is due to three factors: time constraints, money and complexity of the Claim form. Many respondents confirmed, that due to the tight schedule, many faults are fixed by workers in the workshop area. If AUT makes the claim, most of the suppliers want the sample back, to investigate it, but the company simply does not have it. In addition, if the faulty product will end up being already at the customer's site, then getting the component back is not likely to happen. Sometimes, making the claim with only pictures and description is enough, but it does not support suppliers in 100% to improve their processes and avoiding repeating the mistakes. Claiming money back for the faults presents also challenges. Faulty components, costing €10 per piece, are not being reported. As one Category Manager specified:

*“Our customer's penalty to Valmet AUT might be [xxx€] for being late (with the delivery), and we are late due to some small delivery from our supplier, which is worth [xxx€]. Our penalty to the suppliers is [x]% of the value, so in that case [xxx€]. Making the invoice would cost more than the money we would receive.”*

Moreover, the manager was not sure who is responsible for sending the invoices. Also, the exact process of invoicing was thought unclear. Some of the Category Managers have been working for Valmet AUT when it was still part of Metso company and they reminded that the supplier claim database used to be open for the suppliers to log in, review and comment claims being made. However, nowadays, seldom supplier has rights to enter the system. Purchasers, who are currently filling out claims, must save the claim in pdf format and send it to the supplier via e-mail. The response received has to be saved again to the system by a purchaser, so Valmet stakeholders can see it. The process like that is prone to communication gaps and misunderstandings of the fault's core.

Category Manager of DCS products reminded about different nature of his own category products. Each component needs test reports, assembly capacity follow-up and on Valmet

general level- self-assessment and sustainability reports. In that category there are rather partners, than suppliers existing. For this category especially, RoHS directives and RoHS compliance products must be known. The IQ products need tolerance analysis for the metal beams they consist of. The supplier quality of different categories differs due to the procedures required.

In conclusion, the information needs of sourcing and their receipt is challenged by multiple reasons. First, the specifications needed are not always available due to scattered documentation. Also, R&D tends to over-specify their requirements and making it difficult for suppliers to respond to the demand. Second, the system of making claims does not support the pace of working in AUT, as they are being fulfilled inconsistently. This not only makes the sourcing tasks more difficult as there is no reliable track of non-conformance problems at the supplier side. This does not support further negotiation with the suppliers. Lastly, an alarming issue surfaced in this section: all the previously mentioned challenges seem to arise because of the lack of process standardization after Valmet AUT has demerged from Metso and entered the Valmet family.

### **4.3.3 Current supplier quality measures and their application**

One of the outcome goals of this thesis are the key performance indicators (KPI) for the supplier quality. Hence, interview questions involved topic of current KPIs and their application in practice.

Mostly used KPI in Valmet AUT is on-time delivery (OTD). It is a measure followed by category management very closely and from sourcing perspective, the only quality related measure. Reliability and accuracy of the suppliers' delivery is most crucial in securing the good quality of the assembly process of the final product done in-house. This KPI is being discussed with the suppliers in monthly meetings involving sourcing team. If the numbers are low, root cause analysis is required. However, as one of the Category Managers pointed out:

*“Currently OTD is being followed in Excel... I don't really trust that information. But no matter, where the information is coming from it is discussed with the supplier and we ask the reasons of the fluctuations.”*

The OTD measure has been highlighted as most importantly follow quality related KPI. Nevertheless, the data kept by AUT is not considered reliable enough. It is not maintained systematically, as sometimes the values are calculated by AUT, whereas sometimes they are given by the suppliers. Another Category Manager said:

*“OTD calculations are not bulletproof, ordering people or manufacturers are influencing the delivery time. We do not measure on time delivery ourselves, but the suppliers are.”*



Respondents have confirmed that besides asking for explanation and root cause analysis, no further consequences are demanded. As Production Planner indicated, the monetary value is not important in the workshop area as the materials being on time are. Currently, no financial refund is being asked from the suppliers due to low unit cost and relatively high processing cost, as it has been mentioned in the previous subchapter.

Another quality related measure used at Valmet AUT is first pass yield (FPY). The percentage amounts the number of components passing the process with no faults by the first time, so effectiveness versus quality ratio. It is a good measure to follow in the manufacturing world to measure quality. However, HSE Manager brought up that FPY tends to be calculated differently at the suppliers. According that Manager, the measuring should be improved to measure in the exact same way at different supplier to be able to compare the results. The FPY is delivered to AUT information by the suppliers. The Category Management does not follow that measure.

Many of the interviewees mentioned number of claims being a quality related measure used in Valmet AUT. It is a ratio between number of claims made and claims closed. At the same time, the measure was described as good one and a bad one. Category Manager from one of the AUT's divisions stated:

*“Claim number in [division's name] is quite good, gives some knowledge about quality.”*

Other respondents opted for more vague opinion about the current claiming system as quality measure. Expressions like *“claims are considered to be a certain measure”* arose significant amount of times. Those respondents pointed out that the measure as such is not accurate as it is not well used nor monitored. Each claim requires a follow-up, and number of follow-ups were also recognized as a quality measure. Quality Manager noticed that follow-ups need improving as well:

*“We do the follow-up, but how systematically? What actions are we taking and following up? What actions do they cause? How do we react?”*

Moreover, Quality Managers continued that having the company full of engineers, in follow-up meetings the discussion goes more into technical details. He claimed, that in reality the participants should put on customer's shoes and demand from the suppliers what was asked for and showing how do they achieve that.

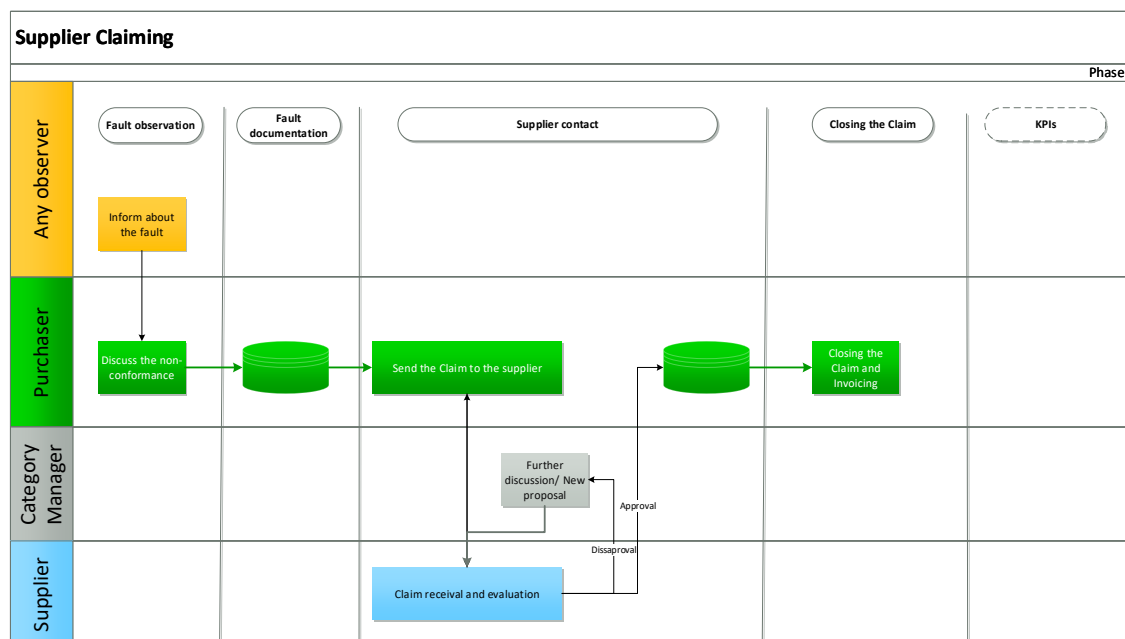
The rest of the mentioned measures are used less often. Project Quality Manager mentioned that quantity of faulty units per product and its supplier is being followed. One or two units are acceptable to be faulty, but when the number rises to around 20 units it starts to concern Valmet AUT. In case of smaller items but in frequent use like IO cards, the claim is made when the numbers reach 100 faulty units. Valmet AUT orders 5000-10 000

units of IO cards per month. Lastly, proceeding documents of suppliers are being assessed. The extent of their completeness varies amongst the suppliers and poses troubles to the reception when intaking orders, as well as causes delays in the workshop area.

In conclusion, OTD was marked as most important and most frequently followed measure in relation to supplier quality. Especially in sourcing department, OTD seems to be the only measure used towards supplier's quality. Number of claims poses a lot potential to be a quality measure, but not without standardizing its processes within the company. Finally, the FPY does not concern sourcing activities directly and will not be discussed further in this research.

#### 4.3.4 Managerial roles of supplier quality process

Elements involved in securing good quality of supplier products in Valmet AUT are as follows: Quality Control, Quality assurance, Claim Management, Cost of Poor Quality (COPQ) and Traceability. The techniques of quality control and quality assurance are spread cross-functionally in AUT. Keeping track of COPQ belongs to the responsibilities of Quality department. Current Quality Manager confirmed that last year's (2017) poor quality costs were quite substantial and that suggests that changes should be made. According to the interviews Claim Management is indeed part of procurement responsibilities, but the accurate determination of roles and person responsible occurred to be unclear. To understand the process of Claim Management and the roles included, the following process flow graph has been created for the purpose of this research. The process of supplier claiming is presented in the Figure 13.



*Figure 13. Supplier Claiming process and roles assigned.*

From the figure, it can be seen that most of the claim making actions are officially in the purchasing's responsibility. The fault is being noticed in the workshop area, after which purchaser should be notified and ready to discuss the non-conformance. Then, entries to VSOP database are made, from which a Supplier Claim is being extracted to pdf format and sent to the supplier attached in an e-mail. In case there are any bigger challenges arising, for example supplier not accepting the claim or not responding to the purchaser at all, then respective Category Manager steps in and continues the discussion. Officially, this is the only role of Category Management when it comes to the activity of making Supplier Claims. They are of course discussed in supplier meetings in frequent time intervals. When the claim is finally accepted by the supplier, purchaser saves the files to the system. Ideally, the claim can be closed and invoices for the cost reimbursement made. However, in reality the process looks very differently. First of all, the responsibility of Supplier Claiming is blurred. It is known that the word "supplier" indicates that procurement is involved, but no particular person is held responsible. One of the Category Managers said:

*"We lack a supplier quality oriented person entirely, who could determine the ability to deliver needed quality by the suppliers. A person who can provide that expertise on more technical level and talk about it with the suppliers."*

Currently Supplier Claims are being filled very randomly, by person who is available in that moment. In the interviews, purchasers and some other respondents pointed out that purchasing team is not suited for the job in question for two reasons. First is the lack of technical expertise needed to describe the non-conformance accurately for the supplier. Second, the existing form that should be filled is complex and does not support systematic way of fulfilling the claims. Moreover, in the Supplier Claiming process one important thing was noticed. Quite often claims are mistakenly claimed from the suppliers, after which they point out the fault was caused internally. It can mean either a physical fault or fault caused due to the not complete documentation or instructions delivered by AUT to the suppliers. Another gap in the process, is that even though Claim is a term used for financial reimbursements, those reimbursements rarely take place. Reasons for that are too big of a workload to conduct in order to retrieve small amount of money for single non-conformant orders. Finally, the claims tend to stay open due to not having a systematic way of monitoring and following-up supplier claims. It is worth adding, that not all the claims that should be filled are actually filled and proceeded with actions. None of the showcased participants in the Figure 12 are measured in any way based on how they perform claiming.

It is noticeable that within the presented process flow there is not any figure from Quality department. In the interview, it was said that people from Quality and HSE department (HSEQ) join supplier audits done in certain time intervals but do not deal with supplier quality issues on a daily basis nor do it on more technical level. Moreover, HSEQ per-

forms audits of internal quality systems but does not interfere with the quality of the components. Hence, there is a gap in the process. One of the Category Managers said that currently only sourcing representatives and possibly a person from R&D might join supplier meeting. However, none of those parties are able to answer more technical questions.

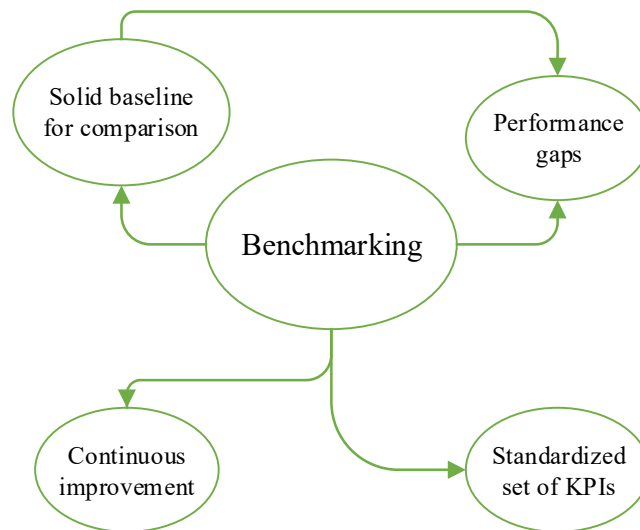
#### **4.3.5 ERP system and other tools**

Some of the challenges that Valmet AUT is facing are caused, or at least are prevented from improving, due to the scattered tools and old-fashioned ERP (Enterprise Resource Planning) system used for daily activities. Hence, the current ERP system in Valmet Oyj is under renewal in a project called Leap Forward. The aim is to bring more transparency to the processes by harmonizing them and unifying existing tools, which for now are very scattered and vary across the business lines. This could be partly explained by the historical background Valmet has with different split ups and mergers across the years. New ways of operating are being set and roles assigned in this new, common system for all business lines. The scale of the reform is significant, as almost 20 applications ERP related are going to be exchanged with one – Infor LN. The new information integrating system will allow better visibility of data across the value chain during the manufacturing and in post-production. Synchronized material intake and manufacturing helps to increase efficiency and profitability. Customized KPIs can be added and visualized for easier tracking in the system's dashboards and reports. (Infor 2018) Those features are very valuable to assembly based companies like Valmet AUT, where the ERP renewal kicked off in February 2018 and is going to reach its completion in February 2019. Not only will the system support better information exchange and workflow internally, but also support in serving the customers with better quality of work.

As it was detected through the interviews, some of the current tools are not exactly supporting the information exchange between different teams within Valmet. Also, the communication between category managers and suppliers through existing VSOP database, where, for example, supplier claims are being made, was found highly ineffective. It was repeatedly brought up by the respondents that the current Supplier Claiming VSOP form is not intuitive for its users. The form requires additional document saving and forwarding them to the supplier by e-mail. Moreover, the system itself does not showcase visually the statuses and actions of Claims to be easily monitored. One of the elements that are going to be developed as part of Leap Forward project will be Quality Management activities and as it has been previously mentioned, those activities include Claim Management. Part of the Claim Management activities are supplier claims, which will be made more approachable for the key stakeholders to maintain. What was been handled in VSOP database so far, will be transferred to collaboration tool called Valcon. The name “collaboration” indicates that both, Valmet employees and suppliers will be able to communicate through that platform.

#### 4.4 Benchmarking procurement functions to assess supplier quality process

The benchmark interviews had the same structure as the interviews done internally. The purpose was to detect Valmet AUT's position compared to other business lines. The aim was, based on that comparison, to identify the possible performance gaps in relation to supplier quality. Figure 14 shows the purpose of conducted benchmarking.



**Figure 14.** Purpose of benchmarking.

In addition to comparison between the industries, the purpose of benchmarking was to develop the standardized set of KPIs for measuring supplier quality. Especially, the KPIs used by other business lines in sourcing teams were point of interest, as in the Valmet Corporation level there is a plan to unify the processes as much as possible. Last purpose is that a company wanting to achieve total quality should practice continuous improvement, and benchmarking is one of the tools to do so. In the first section of benchmarking results, the comments of the Valmet representatives from Service, Paper, Pulp and Energy (P&E) will be presented first. Then, the outcome of the conversation with the corporate level representatives will be showcased.

##### 4.4.1 Internal business lines

When interviewing other business lines of Valmet, it became instantly clear that the quality aspect is a top priority on everybody's agenda. In all the lines, some development processes were taking place, related to quality of the supplier base. In the interview with the Corporate functions representatives it was highlighted:

*“We are working on unifying our processes (between business lines) and our tools. We are working on common management system.”*

In the long run, the goal is to standardize processes, also concerning supplier quality, amongst the business units. This is also driven by the current ERP system implementation process taking place amongst the business lines.

### Quality factors

Factors of quality received through benchmark were mostly similar as in AUT: the components are to meet the requirements, not more or less. Easiness of working with the supplier was detected as a quality factor, their attitude and competence. Also, reliability and being able to trust the supplier about promised delivery amounts, as it was mentioned earlier, are of big importance. Suppliers good responsiveness and flexibility were considered a plus.

### Information needs

When it comes to procurement, some of the business lines use Valmet level supplier network for their own procurement. Surprisingly, this causes problems with capacity forecasts and supplier relationship, as internally there is not a common system where it would be possible to see if there are any orders cued in from other lines. Also, the supplier tends to omit the fact that Valmet orders are from different customers. This results in business lines are competing for the same capacity. Director of Supply Chain from Services business line stated:

*“We have a plan to measure [better] supplier capacity, due to the common key supplier network. Couple of weeks ago we have talked about how to build up this measuring system for Valmet level suppliers.”*

Improving capacity evaluation is a cross-business line goal that was brought up also in the corporate level interviews. Understanding supplier’s capabilities, their load of work and the share of their business compared to other businesses are most crucial as pointed out by the representatives from the Corporate functions. Moreover, they said:

*“Not all the suppliers are able to manage their load. They tend to take too much work. and when they have too much to do, then the quality comes down.”*

Supplier’s ability to fulfill the capacity demands is crucial for factor determining good quality. And suppliers will do everything to prove they can do the job, even if that would mean assuming the ability and hoping for the best. That is why it is important for the companies to be able to assess the supplier capability on their own. The Head of the Global Procurement reminded that the company is now looking for suppliers in new areas, which makes the focus on the load even more important. He said:

*“It is our responsibility to make sure they are able to provide. We cannot make it their responsibility.”*

The background of this statement is that business lines are sometimes using same suppliers without knowing that and supplier does not realize the requirements and the order inflow can differ between the lines. Due to sharing supplier base with the capital base, the quality related information needed varied amongst the business lines. In Services business line, information about the lead times, prices were found most important. It was declared that they do not focus on more details, as they trust that has been taken care of on Valmet level – when the corporation approved the suppliers as part of their cross-organizational supply base. In Paper unit, the information needed by the sourcing is more extensive. Certainly, technical specifications, drawings, quality reports and component catalogues are required. Moreover, there is a plan in that business line to prepare collecting list of documents needed based on each stage of purchasing. This should aim to minimize the amount of not fully specified products that are asked from suppliers to provide. Also, representative from P&E said that scope should be defined clearly enough and that information is greatly needed by the supplier. Especially in the Service business, the challenge is to think ahead of what supplier might need to deliver what is asked for. This is due, to having new suppliers who have never manufactured Valmet's parts before. The documentation poses difficulties, also because of fluctuations in Service business and hence, lack of time to update everything properly before sending it to the supplier.

*“There is no way to have all the documentation updates, due to the millions of files.”*

Sourcing Manager from P&E highlighted that aim is to deliver fully complete documentation, but with minimal needed technical requirements as the information given to the supplier should not overflow them as it usually does. He suggested that there should be different lists of documentation for different categories set. In the P&E line only recently a person was hired, as a Supply Quality Manager, to take ownership of these (and many more) activities, as they believe this will contribute to improving supplier quality greatly. On the corporate level, the information needs are similar as in business lines, but more on a global scale. It was highlighted that Valmet in each geographical area should take care of their own processes and strive for improvement. For example, when the Supply Center in Tampere does business with Chinese companies, it is the responsibility of the Valmet in China to inform about any possible circumstances that might arise when exporting to the that country.

The representatives in the corporate level admitted that the documentation is not up to date and presents challenges when sourcing. As an example, the Head of Global Procurement brought up the case of a supplier in foreign country, where he asked what was causing the most problems to them in Valmet's orders. Turned out, the shade of the color of the paint that was required to use in the order, posed difficulties for the suppliers to paint on their own. Hence, the painting job was outsourced to another workshop. After some investigation, it turned out the use of color requested by Valmet did not have any justification. It was due to overlook in requirements updating in a document created 20 years before, where delays were taking place due to difficulties with painting the pieces ordered

by Valmet in certain color. As the interviewee said, the problem was twofold: documentation was one, but second was the supplier not communicating their concerns. In conclusion, it is not an example of bad quality of the product, but bad quality of the process surrounding it. The story presented can be a metaphor for all other issues related to communication with the suppliers.

#### Quality related measures

Big part of benchmark focused on determining supplier quality related measures. Within Valmet's business lines the KPIs were similar as in AUT. The list of determined KPIs are presented in the Table 9.

**Table 9.** List of benchmarked supplier quality related KPIs.

Business line	Quality KPIs
Services	OTD, lead time, quality deviation, number of claims, amount of feedback
Pulp and Energy	OTD, quality deviation, total cost of poor quality (by project)
Paper	OTD, number of claims, amount of feedback and reclamations, total cost of poor quality

All Valmet's units follow OTD (on-time delivery) as supplier KPI. In contrast to AUT, where the OTD is followed in Excel file, in rest of business lines OTD is shown in their internal ERP system. In Services and P&E, also quality deviation was said to be measured. This measure takes different forms, for instance, approved and rejected ratio of components. In Services and Paper business lines, number of claims is also followed. As opposite to AUT line, where the claim count is not considered reliable measure, in those lines the nonconformities claimed give good view on supplier's ability to supply quality products. In P&E line, claim number KPI was thought not enough as currently it only measures monetary reimbursement requests, as well as approvals and disapprovals. However, in all the lines claims are being brought up in the monthly supplier meetings. In the benchmarked business lines, there are Valmet level suppliers, which are maintained through Supplier Relationship Management system (SRM). Sourcing Manager from P&E mentioned that with those key suppliers there are more frequent meetings (2-4 times/year) on a bigger scale to address continuous improvement and solve possible problems.

Another interesting KPI that was revealed, was amount of feedback given and received. The representatives of the Corporate functions mentioned that they would be interested in following up such feedback KPI. Currently on their level information is missing of what kind of feedback is given to suppliers from Valmet's business lines. Also, the feedback business lines are getting from the supplier's is a concern of the Corporate functions. They suggest that feedback given and claim amount ratio would be an interesting measure to use across all the business lines. In Services and Paper units, amount of feedback given



to the suppliers is documented and followed. Track of conversation held about material reimbursements and other improvement comments is kept. Besides feedback given, also feedback received is measured. As Sourcing Manager from P&E stated:

*“The best supplier assessment is when ourselves we get 2-3 homework exercise.”*

Feedback measuring can be done by setting a certain percentage target to complete. Meaning, that fixed percentage of feedback should be addressed and responded to. For instance, the target could be 80 percent of total feedback income and the current state is monitored according to the target. This would support continuous improvement of tasks, where majority of arising issues would be taken into account, rather than only the ones with financial implications. Finally, last quality related KPI was found to be total cost of poor quality. In P&E and Paper line, that is calculated in the ERP system and is shown in reporting view for sourcing to see. The costs are usually calculated per project. Especially in Paper line, TCO was considered to be strong supplier related measure used by sourcing department. Of course, also in those line there is a challenge with having all the data inserted correct, but it seems to be more accurate than following such data in Excel like in AUT. When it comes to sharing the KPIs with the suppliers, not all of them presented are and some are only given to the key suppliers. Finding more accurate KPIs to measure supplier quality is a hot topic around all Valmet business lines. For example, in Services, just weeks before the interview there was a talk about a plan to build up further the measuring system for the key suppliers. Interestingly enough, the representatives of Corporate revealed:

*“One thing that we tend to forget when managing suppliers, is that we should follow-up their financial situation. That is not something that we necessarily always remember.”*

The follow-up is usually in two ways, first when talking to the supplier in the conversation, second researching the available data. Public companies are easy to check on through systems, especially in Finland. Abroad there might be challenges with that, as well as privately owned companies might not have the data openly available.

### Roles

When talking about roles of different supplier related activities mentioned, the claim system turned out to be handled differently across business lines. For example, in Paper line, a purchaser only makes the claim and monitors the process steps, but it is the Quality department that follows the corrective actions made by the supplier. As it was mentioned earlier, the process of handling the claiming issues is currently undergoing changes in the P&E line, where there is entirely new position in the structure dedicated to the supplier quality follow-up. This is a contrast to AUT's process, where there is not a quality knowledgeable person involved in the claim reviewal.

#### 4.4.2 External companies

During the time of the research, two companies (A and B) were benchmarked to get practical insight in how supplier related issues are being approached and handled elsewhere. Both companies operate in different industries than case company, but have similar organizational structure and are in manufacturing business. Company A is in metal industry and company B is in nuclear power industry.

##### Quality factors

Based on the answers of the representatives, supplier quality is on their top priority agenda list. It is in big part due to the industry they both operate in (nuclear and metal in outdoor environment). The most important aspects determining good quality given were the usual: error freeness, fit for purpose and delivery accuracy. The company representative A said:

*“Rather than single components, we buy system solutions. Instead of defining all the hardware pieces and so on, we describe in detail the performance we want to achieve. We leave it up to the supplier to suggest us the appropriate technical specifications.”*

This approach requires to have a good, partner-like relationship with the suppliers to open the dialogue for innovating and creating value together. Something that was underlined multiple times in the interview, was that the communication with the supplier is the key to maintain good quality levels of the sourced products.

##### Information needs

Information needs varied, as especially the profile of one company operating in nuclear industry requires much stricter approach to exact scoping of the products. From procurement in company B point view, aspects like the impact components have on safety were very important. Also, both companies had extensive lists of requirements they need the supplier to fulfill in order to hit right performance levels. However, as it was highlighted by the respondent B, that does not mean that the information send to the supplier can be too extensive. Interviewee A said:

*“There tends to be this mismatch between quality demands and what is important and what is not.”*

It is important to choose what is needed and what is not by certain supplier. Due to the characteristics of the benchmarked companies' industries, the open dialogue with the supplier about the realities of the components usage is needed.

##### Quality related measures

Measures that are used by the benchmarked companies are similar as in other industries. On-time delivery, FPY, PPM and number of claims made are used most often. In one of

the companies, not only the number of faults during warranty period is kept tracked of, but also the feedback amount given to the suppliers about faults taking place after the warranty period expires is also measured. When it comes to the claims, there have been several comments worth highlighting from company A:

*“Claims are made always, we tend to be quite strict about it. We are aware that sometimes we do not get the compensation for the claims made, but we always ask for it. And we ask for compensating the cost of the whole work it cost us, not just the component cost.”*

The interviewee highlighted that even though those claiming actions not always result in receiving full asked amount, it sends a message loud and clear to the supplier that the quality of the sourced components is not something that can be underestimated. There is not that much of unofficial feedback going through e-mails or conversations, the fault is always reported through the official channels. The respondent A said:

*“Usually, we have agreements with the supplier about what the compensation is if the faults numbers exceed certain level.”*

The official communication channel about the claims in the benchmarked company was a special web-portal that both, the company and the suppliers have access to. There suppliers can follow not only the number of claims and their exact consequences, but also supplier scorecard, where delivery accuracy and assessment are some of the things presented. There are no exact rankings showcased to the suppliers, but the data that is available there portrays well the performance of the suppliers and the needs of the company. The measures used are being showcased visually in a system, where things like monetary implications of the claims are easy to spot. Also, statuses of the different claims make it whole lot easier to follow if visible all at once. Delivery accuracy is also tracked through graphs available in the system.

When asked about preventing quality fluctuations, the company representative B said it is done through claiming and selecting suppliers strictly based on their performance. If one supplier does not live up to the levels of the other one, it is not selected. The company B is having its KPIs underdevelopment currently as the supplier quality there also was found needing redesigning. Respondent from that company argued that the percentage of the error-free products should be another measure to be followed continuously. Moreover, he said that quality should be a number one supplier selection criteria. As it is an effective way to influence the supplier with the quality oriented mindset and communicate that the deal is lost if the quality will be compromised. He also highlighted, that it is at most importance to check the quality processes in practice, not just based on the PowerPoints presented by the suppliers.

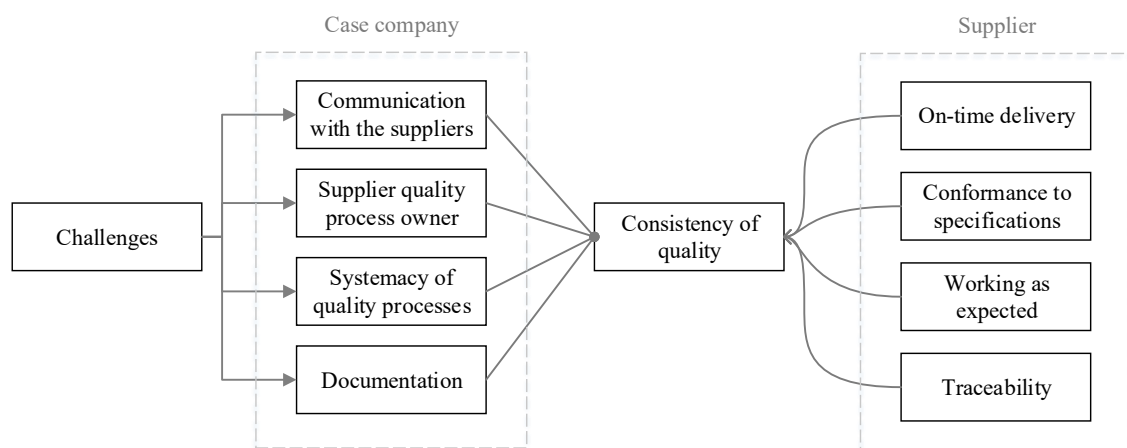
## Roles

In the company with the strict claiming system, the body responsible for claim making is the Quality department as opposed to the sourcing or purchasing. This is due to the technical expertise that a person documenting the fault should have. In that particular department, the person sending a claim is entirely responsible for quality of supply related issues. According to the interviewee A, there is a close cooperation in place with the sourcing department about the claims, but it is not a necessity in all the cases. Only in more difficult cases the sourcing team steps in. And in the company one simple rule is follow: person who opens the claim, makes sure the claim is being closed.

## 4.5 Construction of a renewed supplier quality process

### 4.5.1 Improvement suggestions

Valmet AUT is an assembly-based company and purchasing costs make up for a significant extent of the total amount. Because of that, it was made clear by the interviewees that the supplier quality topic is very high in the management's agenda. The analysis of the data collected has depicted multiple areas of quality dimensions that need improvement in Valmet AUT. The areas have been divided into two sections: the activities affected by the case company and activities affected by the supplier. The challenges are presented in the Figure 15.



**Figure 15.** Areas to improve concerning the supplier quality.

In the figure, it can be seen that there are four areas affecting supplier quality at the case company - Valmet AUT. Communication with the suppliers should be more open and concrete, for example towards the forecasting schedules. It was said that the case company struggles with having all the data accurate towards scheduling of the production, and that should definitely be in main focus of AUT to improve. However, more focused

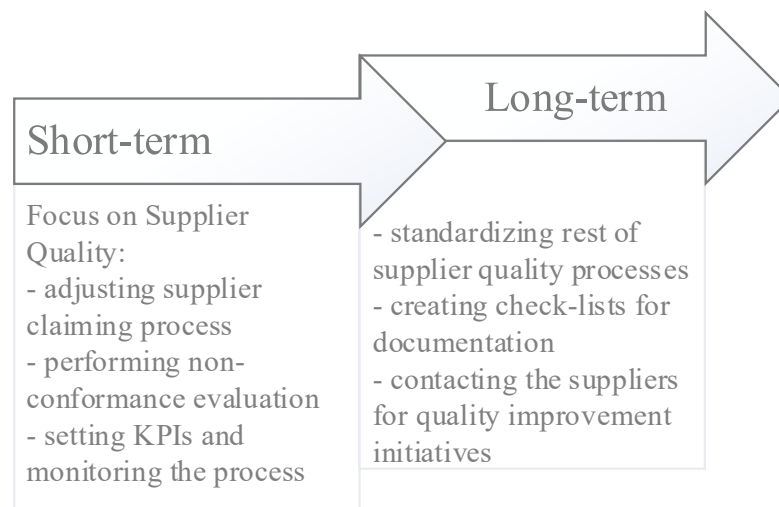
challenge that arose in the conversation with the sourcing representatives is that the supplier quality issues that arise currently quite systematically do not possess a process owner to maintain and improve those areas. As it has been mentioned, the most visible process lacking a responsible figure is the supplier quality claim system. The reason this is so important is that it does affect the consistency of the supplier quality. It also could be pinned under the open communication channel with the suppliers. Forming more of a team relationship supports improving quality greatly.

Furthermore, the systemacy of different process would need updating. Some of those processes will likely be solved due to the new ERP system coming to take over most of the old tools used in AUT. The new change presents great opportunity to revise and reestablish how things are being done. It seems like the demerge of the Automation business line from Metso relatively late (in 2013) compared to other business lines caused some inconsistencies in how supplier processes are being handled. With the new ERP change, it is high time to revisit the topic. Lastly, the documentation, which for the sourcing managers is the base to converse with the suppliers to what is expected to be delivered was found inadequate. At times, it is full of overspecification, which makes it very complex for the supplier to fulfill such demand. It is due to the fact that the responsible department for documentation is R&D, who lack the commercial understanding and market availability. Another reason for inadequate documentation is all kinds of cost-cutting incentives in the past, which included storing the technical information at the supplier's and in result losing some data due to resolving cooperation with that supplier or their bankruptcy. Of course, the task of updating all of the existing documentation is rather impossible, still update of most important components and solutions should take place. All four of those mentioned areas affect the consistency of the quality of the supplier products. Next, quality factors determined to be most significant in the empirical analysis, will be discussed.

In the Figure 14 are seen on-time delivery, conformance with the product specifications, working as expected and traceability. In the interviews, those were said to be most crucial and giving biggest impact on the offering Valmet AUT has. It was depicted through the empirical data gathering, that delivering good quality product not on the forecasted schedule does not leave the customer with a sense of having received good quality. Also, delivering goods on time but not according to the specification does not result in good quality perceived. Moreover, the product in the end is expected to work as promised, so if that does not happen after the product was manufactured by the specifications the quality requirements are still not fulfilled. Hence, on-time delivery of the supplier goods, manufactured according to the design and working as expected are crucial to good quality delivery. Lastly, preventing any quality inconsistencies are secured by having traceability system in place. Ideally all component that are incoming to AUT reception would be error-free, but there are always exceptions were that does not take place. The ability to track down the non-conformant component from certain batch is time and cost saving. As it has been mentioned, the offering of Valmet AUT are not products but solutions. And

those solutions are expected by the customer to be functioning and within requirements. Since there are a lot of quality controls and testing that should be conducted despite the quality, any additional quality work should be minimized. The customer's main focus is to have error-free product.

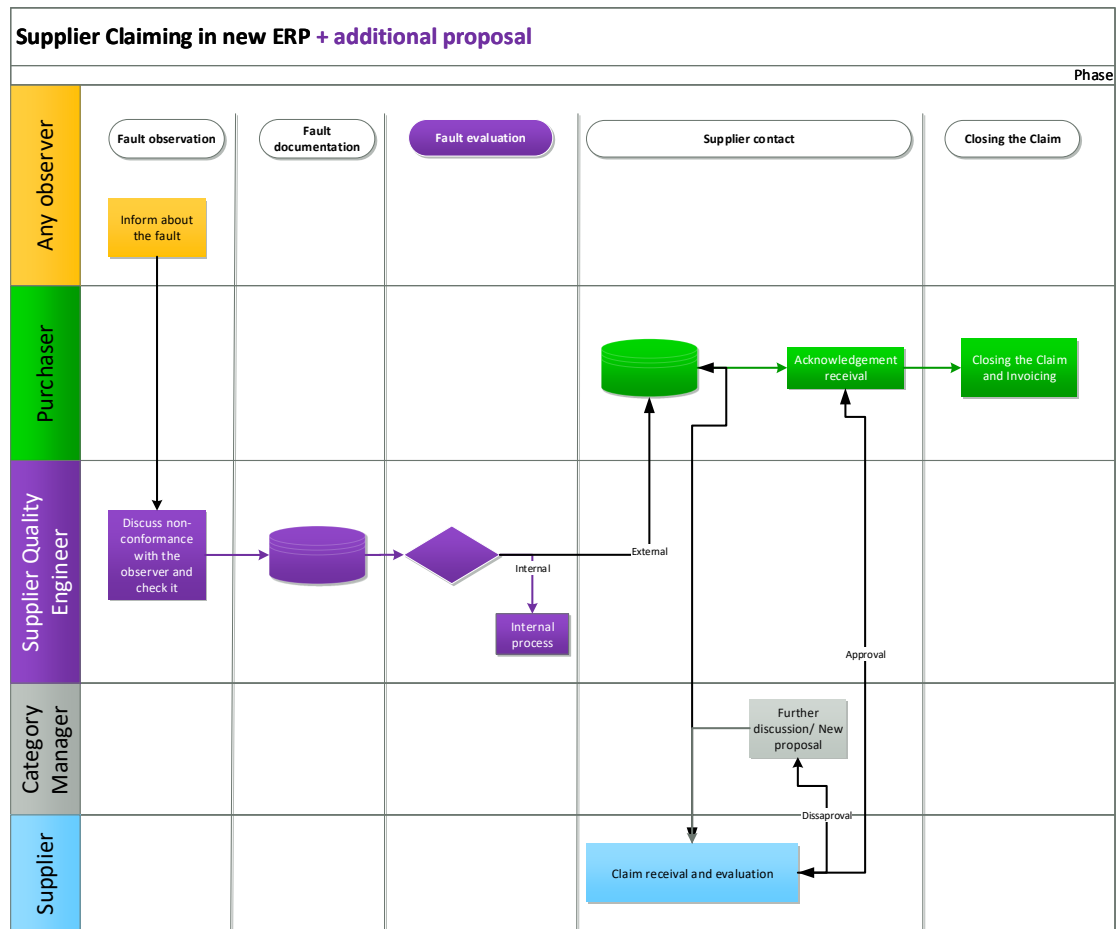
Since error-freeness and consistency of quality are so highly dependent by the mentioned areas, those should be first in line when improving supplier quality. As the analysis showed, a process owner for supplier quality related issues should be designated. Hence, the improvement proposition in this thesis work is to create a new position within Valmet AUT structure. In the Figure 16 are presented responsibilities that the position should consist of.



**Figure 16.** Proposal for short and long-term scope.

The proposal is divided into short and long-term scope. The reason for this differentiation is the urging need to address certain activities first. In the short-term the focus is to be put mainly on standardizing the supplier claiming process, as this was repeatedly mentioned by the interviewees. Not only the current process in place does not provide enough value but also affects negatively the quality consistency as the suppliers have the right to know about possible non-conformances that are caused by their processes. Conducted benchmark showed the supplier quality performance in significant part is measured based on the number of claims that are made. What is interesting, the Procurement Update report of the sourcing's team in AUT does not include any KPIS that relate to quality of the suppliers besides the OTD. Hence, the proposition in the short-term is to adjust the claim process and assign KPIs that follow each stakeholder's work within that process to be established. The current process of supplier claiming, presented in the Figure 12, was investigated to detect the what is working the best and what does not. The steps of the process were established based on the interviews and validated by the stakeholders to assure the best process flow. Also, the task distribution was evaluated to secure the efficiency of the claim filling process. The standardized way of proceeding was introduced

to make sure the claims and what they represent will live up to their potential. The process proposal is presented in the Figure 17.



**Figure 17.** Proposal of new supplier claiming process.

Process presented in this figure is very similar to the one presented in the Figure 13 with some differences. The main difference is added new position of Supplier Quality Engineer (SQE). The reason for that is the identified lack of supplier quality process owner within the AUT's organizational structure. This was highlighted clearly in the interviews by the employees from different positions and departments. That person would take over the tasks that, at least officially, were the responsibility of purchasers. For starters, purchasers do not have enough of technical expertise to communicate the nonconformance appropriately to the suppliers. Moreover, they lack time to physically check the component in the workshop area, document it, communicate about it with the suppliers and constantly monitor the status. Having a SQE discuss the non-conformance with the observer and fill the documentation in a unified way would help in the claiming process standardization.

Worth noticing is the new step in supplier claiming added, which is the fault evaluation. This is suggested, as it was depicted in the interviews that claiming a fault supplier's is the easiest shortcut to pass on the improvement responsibility. However, both parties,

suppliers and AUT lose the potential on improving their processes when not taking a closer look on the non-conformance and the real reasons for their occurring. Next steps are back in the duty for the purchasers. This is because of the partner system existing between the Category Managers and the respective category Purchasers. It is crucial to have the purchasers still monitor the status of the claims, as they are the primary employees who make the operative purchase of the components. If the quality issue that was claimed will not be solved, it is a clear message to the purchasers to consult with Category Managers if the items can still be purchased. In order to assure all the stakeholders from the presented process to fulfill their tasks, certain KPIs are proposed. Those KPIs will be discussed in subchapter 4.5.2.

To sum up the points in the proposal for the short-term, having SQE take over the documentation responsibility in supplier claiming has great potential in process standardization, more thorough evaluation and better corrective actions suggested. Also, the claims being properly conducted will bring more value to the sourcing activities.

In the long term, the scope of standardizing processes is suggested to go beyond supplier claiming process. Newly created position of SQE should be responsible for processes like examining the quality of supplier also prior contracting phase. As it was said, currently it is only sourcing, and possibly R&D person, who do such examination in the case company. However, they do not possess enough technical know-how and commercial understanding each, to conduct it the best way. The sourcing representatives will always have commercial goals as the top priority and R&D will defend all the technical details that the component should have. The SQE would be the one responsible for finding the balance between those requirements and have the supplier's interests on its agenda as well. This would not only provide an opportunity for better quality improvements, but also allow to nurture the relationship with the supplier better.

Moreover, in the long-term it would be beneficial to create specific check-list for the sourcing department to follow when contacting the suppliers. The benchmark of other business lines showed that these kinds of pre-prepared lists are practiced there, but are not a standard. Even though, such list may already exist now, they are quite generic and also do not take into consideration eventual updates that the documentation of certain solutions would need. Since the existing documentation seems to cause significant hustle with the suppliers, after giving it some thought, this research's proposal is for the SQE to take on the creation of such check-lists. It would be a step forward towards starting to organize and update the existing designs and their technical requirements documentation. Finally, the last task of SQE is suggested to be working on a quality improvements with the suppliers who are the most critical to the Valmet AUT operations. This should be made more efficient and consistent with the supplier claiming system already standardized, as it allows constructing clear views on what is expected.



Having described short and long-term plans for the new position to be created at AUT, the official roles and tasks are shown in the Table 10.

**Table 10.** Roles and tasks of Supplier Quality Engineer.

Supplier Quality Engineer	
Role 1: Ownership of supplier quality processes and tools	Tasks: <ul style="list-style-type: none"> <li>– Quality follow-up and clarification of supplier quality related issues</li> <li>– Development of processes and tools for supplier quality function</li> <li>– Quality evaluation done in-house: determination of internal and external faults</li> <li>– Drives improvements at suppliers to achieve benchmark quality and delivery levels</li> <li>– Technical communication between sourcing, projects and suppliers</li> <li>– Report KPIs on weekly basis</li> </ul>
Role 2: Link between Sourcing and Quality department	

First, the role of the SQE would be to take on the ownership of the supplier quality processes and tools that come with it. The tools are, for example, the systems that come with the new ERP and KPIs that allow to monitor the supplier quality process. Moreover, the role would involve being a link between sourcing and quality department, as currently those two are divided and do not interact too much. The tasks of SQE would all kinds of follow-ups of the supplier quality related matters. Continuous development of processes like the documentation will be also part of the activities. The newly created phase in supplier claiming, fault evaluation, will be the task of SQE. SQE would also hold the technical voice to use between different stakeholders and the suppliers. Lastly, more operative task will be reporting KPIs to the management on weekly or monthly basis.

In conclusion, the solution consists of slightly altered system of supplier claiming with the non-conformance evaluation stage. Moreover, certain KPIs are set to motivate proceeding with actions. This way the process will be better communicated to all stakeholders. Lastly, a new role in the organization is suggested. There are of course two ways to approach this role creation. One is to organize a complete new hire to the company, or create an interesting career opportunity for the employees already within Valmet. It could pose as a career advancement step.

#### 4.5.2 Supplier quality measures

The focus of this research is supplier quality, its dimensions, information needs and ways of measuring it. The former two have been already answered in the previous subchapter.

The last objective of the research are the measures that can be used to measure supplier quality. The interviews shown that current KPIs that are used by the sourcing team for the supplier performance measurement do not assure good quality results. The current measures that are followed the most by sourcing team is OTD and number of claims. The OTD is a standard measure used when assessing the reliability of the suppliers. In Valmet AUT, number of claims defines the whole process of reception of the supplier offering, which can include more vast factors than just the products technical side. When it comes to following up the number of claims in the case company, the process was found defective and in need of re-establishing. Moreover, in the interviews it was depicted that having certain KPIs in place help to steer the process into correct direction with all the stakeholders fulfilling their duties.

Due to the limited time and area of focus during this thesis research, the KPIs developed are only for the claiming process. Harmonizing the claiming system in AUT became a short-term, and most immediate goal to be addressed. Hence, the focus on those KPIs was most crucial and were added to the renewed supplier claiming process shown in the Figure 17. There is a KPI developed for each stakeholder involved in the supplier claiming process. Those are illustrated in the Table 11.

**Table 11.** Key stakeholders of the supplier claiming process and their respective KPIs.

Responsible person	KPI
<i>Purchaser</i>	Claim closing time of own category
<i>Supplier Quality Engineer</i>	Closed vs. open claims
<i>Category Manager</i>	Closed vs. open claims of own category
<i>Supplier</i>	Claim closing time

For the *purchaser* who takes care of more operative task and is main, daily contact person with the supplier, is suggested to be measured by own category claim closing time. This means that there is a fixed amount of time a purchaser has until the contact with the supplier to be claimed has to be taken. Because in AUT there is a system of a purchaser and Category Manager working on one category together, the KPIs might differ from one category to another. The reason for that is the differences of the components and their importance, as well as the percentage of total spend that is used per category.

Next stakeholder in the claiming process is the newly created position that is suggested to be implemented in Valmet AUT- *Supplier Quality Engineer* (SQE). The measure for SQE to follow is the number of open claims and number of claims closed. This means that the person would be held responsible for monitoring of the status of the claims and the way they are resolved. Currently in AUT, there is no such follow-up and the claims stay open, as well as what is asked is not necessarily delivered. This KPI aims to fill this gap in the supplier claiming process.

Next, the *Category Manager* is to be measured by the same KPI, but from own category point of view. It is very close to what is being done now, however, the previous KPI would ensure more reliable follow up of the claim number as a supplier quality KPI. Last and central stakeholder of the claiming process is the supplier. The *supplier* is to be measured by the claim closing time, which could be established during the contracting phase. Meaning, the time the supplier takes to process, respond and take on corrective actions is to be closely monitored and enforced. The KPI is needed to show clear message to the supplier that the quality is to be on agreed levels and any fluctuations will not remain unaddressed.

Presented KPIs are believed to be good guiding measures on what is expected when claiming non-conformances from the suppliers. The quality measures depicted as most influential to the components sourced by AUT are on-time delivery, according to the design, working as expected and traceability records. All those areas, if occurring in daily processes, must be communicated to the supplier. Otherwise none of the parties can learn and improve their processes. Registering non-conformances through standardized claiming system with assigned KPIs for each step of the process, is believed to improve each of those troublesome areas.

#### **4.5.3 The influence of the future ERP system**

As the company is nearing towards having new ERP system implemented, it was noted during interviewing that many of the challenges that the company faces are due to outdated and scattered operation system. This research does not contribute to the development of any of the ERP tools in the future, but it does give a minor suggestion to implement. Seen in the Figure 17, the valuation stage in the claiming system has been added to determine the source of the non-conformance. This implies adding a step to the process, which new ERP could support in presenting a platform that SQE could use to assess the fault. The new ERP will consist of different tools, which according to the plan should be able to transfer data amongst them, making it easier for all the stakeholders to view current status of processes. Supplier Claiming system is one to be revolutionized by the ERP as well, and hence the suggestion takes the changes into consideration. However, at the stage of finishing this research work, the ERP implementation is still in the works and the details about it could not be given.

## 5. CONCLUSIONS

### 5.1 Summary of the empirical findings

This thesis work concentrated on the area of supplier quality from sourcing point of view. The aim was to develop ways of measuring the quality of the suppliers to minimize its fluctuations. Moreover, all the stakeholders involved in supplier relations were to be given a solution to have a more accurate view on the current quality status of the products. To provide the answers for the goal of the thesis, the following three objectives were formulated and presented in the beginning of the research:

*What are the quality dimensions in sourcing?*

*What are the information needs of quality process in sourcing?*

*How to improve supplier quality measurement and related quality process?*

To start with, the research had an objective to define the quality dimensions of sourcing. That was discussed in the subchapter 4.2, where the most commonly arisen dimensions and measures were presented by the interviewees. The dimensions depicted as most important were reliability, conformance and performance of the suppliers offering. The measures that followed each dimension were, respectively, on-time delivery and working as expected, according to the design, as well as traceability records. Those dimensions with their measures were found influencing the activities of the sourcing function of Valmet AUT the most. The issue of supplier quality and its effect on the work of the whole supply chain was highlighted and assurance of accurate related data was revealed needed. The goal of the sourcing department is to source and provide supplies on time, in the right amount and of right quality. Hence, the consistency of quality and its delivery can be assured when the mentioned measures are closely follow and enforced.

The outcomes of the second question were presented in the subchapters 4.3.1 and 4.3.2. In the scope of the whole supply chain, the knowledge about the supplier's own supply chain and capacity abilities were found very important. As the sourcing is in charge of the commercial part when dealing with the suppliers, the information they require the most is a complete list of technical specifications and quantities, based on which, further negotiations can be done. The interviews shown that having complete and up to date documentation is a process yet to be standardized and improved at the case company. Moreover, the forecast of the required amounts of components is a basic thing that sourcing managers can operate with. This is something that case company struggles with in achieving accurate forecast to provide to suppliers. Finally, the information needs from sourcing point of view is to know any emerging non-conformances of the sourced products. This

is done by filling claims to communicate to the supplier the occurred fault and enforce corrective actions. The number and the content of claims can provide a good basis for communicating to the suppliers clearly what is expected. However, at the case company the number of claims is not considered reliable enough to give a sufficient picture of the real status of supplier quality.

The third and last question concerned ways of measuring the quality of suppliers and was answered in the subchapter 4.5.2. The ways of measuring supplier quality by the sourcing representatives are rather limited, as they should be easy enough to check, follow and understand, as well as have a direct translation for the commercial conditions of the contract. After evaluating different options, and alternatives, two measures were found the most beneficial and realistic for the sourcing managers to follow: OTD and number of claims. The main realization of the research was that there are many information gaps in processes in relation to supplier matters. Activities like supplier claiming turned out to be lacking a process owner. Moreover, the claiming process steps were needing simple KPIs to monitor the status of various supplier quality challenges. In the end, the following KPIs for the stakeholders of supplier claiming process were developed: claim closing time, ratio between open and closed claims, as well as the ratio between the amount of reimbursement received and claimed.

From the practical point of view, the thesis aimed to provide the case company a renewed supplier quality process with specific roles depicted. Furthermore, a set of supplier quality KPIs were wished to be created. Hence, a proposal has been created to address the most immediate need for supplier quality improvement – the claiming system. Proposal was developed including a process owner for the process tasks that needed someone to be held responsible for. This is how a description of responsibilities and tasks of Supplier Quality Engineer were introduced. That position would take ownership of supplier claiming process, as well as all the other supplier quality related matters like documentation reviewal in the long-term.

The external benchmarking that was conducted during this thesis work helped in validating the supplier quality approach in industrial companies. One of the challenges that other Valmet divisions faced was the complexity of supplier capacity evaluation. That had a direct correlation with the quality of the deliveries. The benchmark revealed that the quality of the suppliers is not something that can be compromised and has to be given a lot of attention to. In the benchmarked companies, resources are given to continuously develop and maintain the quality of the suppliers. Another challenge was the state of the documentation upon which the orders to suppliers were made. Hence, in all the other business lines of Valmet (P&E, Paper and Services) there is a person dedicated to reviewing the quality of the supply on a technical level. Moreover, the benchmark of the Global Procurement representative showed the need to standardize the supplier related KPIs, as currently there are impossible to compare between the business lines. In the externally benchmarked company there is a Supplier Quality Engineer position, that includes working

tightly with the Procurement and Quality departments. That person is in charge of establishing and following the KPIs, as well as monitoring the claims closely. It was highlighted by the respondent, that even if the compensation is not likely to be expected, the claims are always filled to keep track of all the arising issues and communicate to the supplier the importance of resolving the non-conformances. In overall, the benchmarks showed that although the solution proposed in this thesis is not radically new, the need for it is well justified.

## 5.2 Implications of the results in literature

The focus of this study was to detect the quality dimensions, the information needs of quality process and how the supplier quality can be measured – all from the perspective of the sourcing team. The literature sources showed that companies that purchase a significant amount of components from external sources, need to constantly improve and monitor the quality, delivery, cost and the design of the products (Lewis 1998; cited in Krause and Scannell 2002, p. 14). The suppliers in great part determine the costs, quality, technology and profits a company can gain (Krause and Scannell 2002, p. 14; de Araújo et al. 2017). Moreover, it was said that procurement is given a great responsibility in making customer projects successful. This has proved true in the case company. Based on the literature, it was pointed crucial that quality guidelines are not enough, if individuals are not assigned the responsibilities with executing them (van Weele 2014, pp. 231-232). The research conducted in this thesis revealed that in the case company the responsibility of supplier quality indeed lacked of assignment. The first objective was to determine quality dimensions in sourcing. The dimensions that arose during the interviews were in-line with the theoretical depiction of quality factors presented by Garvin (cited in Sower 2011, p. 7). For the activities of sourcing, the most important are the reliability, conformance and performance of the components. Having the focus areas determined, the research revealed information gaps that occur in securing all those three quality factors of the suppliers offering.

Second objective included determining the information needs. Van Weele (2014, p. 203) highlighted the essentiality of clear communication with the suppliers. The literature sources highlight the importance of early participation in the scoping phase of the components. Representatives of the sourcing team should be included in the scoping phase of technical specifications that are ought to be sourced. This is because they possess commercial understanding of the reality of supplier's capabilities. Well sourced supplier can grant not only performance levels that conform the expectations, but also be a counterpart in the innovating process together with the company's R&D. (van Weele 2014, p. 53) Moreover, having sourcing managers included in the early stages of product development process allows them to adjust the criteria for the supplier sourcing method early enough

to deliver desired results (Lambropoulos 2007; van Weele 2014, pp. 195-197). The research has shown a deviation from these practices in the case company. Officially, as was presented in the Figure 10, the participation of the sourcing representatives is included before RFQ processes. In the reality, the sourcing department is not contacted on-time enough to contribute to the scoping of the components. The research showed that Category Managers contact the suppliers before they know the exact specifications required, as the data is not easily accessible and changed in last minute. The literature findings confirm that over-specification of the requirements is harmful to the efficiency of the relationship with the suppliers (van Weele 2014, pp. 195-197). Yet, it was confirmed the documentation tends to be extensively detailed and making it difficult for the supplier to satisfy the requirements. The suggestion of the new role in the organization, Supplier Quality Engineer, addresses those deviations between the theory guidelines and current situation. The tasks of such person are tailored to secure improvement in the documentation and coherency of the technical specifications that are forwarded to the supplier.

As has been mentioned by van Weele (2014, p. 13), accurate forecasting and logistics of the delivery improve the liquidity of the company. Especially in the company that does assembly projects, having components on time and in right quantity is essential. However, the research showed that forecasting made currently in the case company is not accurate enough and making both, the company and suppliers undergo logistic challenges. The suppliers are pressured by unexpected higher quantities that were not agreed beforehand and hence, they start to compromise on the quality. This issue most likely will be solved by the upcoming ERP system in Valmet AUT.

Third objective aimed to detect appropriate measures for monitoring the performance of supplier quality. The literature review pointed out the extent of importance in addressing the topic of quality and the ways of measuring it quite clearly. (de Araújo et al. 2017) Setting measures for the supplier performance monitoring is one of the key elements of achieving total quality (Goetsch and Davis 2010, pp. 10-12). As the source stated, having accurate and measurable data helps to monitor the quality and improve processes. Furthermore, Goetsch and Davis (2010, pp. 10-12) highlighted that to achieve total quality, the involvement should be cross-functional and cross-organizational. That is why having a process in place, which includes all the important stakeholders and has relatable KPIs assigned allow to reach for quality improvements. In Valmet AUT, the measures monitoring supplier quality existed (on-time delivery and number of claims), but were not used efficiently enough.

This result was expected, as this knowledge was a trigger for the topic of this thesis work. The literature clearly states that part of the post-contracting process of procurement activities is making claims (van Weele 2014, p. 98-99). Moreover, claims are seen as a message that can be communicated to the suppliers about the importance of quality that is delivered. Van Weele (2014, p. 53) stated that part of sourcing's task is improve con-

tinuously and include suppliers into the R&D conversation. The solution developed focused on standardizing the claiming system and as result, making the KPI of claim numbers a reliable measure to follow. This was done by implementing KPIs assigned to cross-functional stakeholders. This aims to secure the flow of the claiming system process and make the follow-up process as part of continuous improvement.

To sum up, the procurement representatives should be involved in the sourcing process as early on as possible. The success of the projects is in hand of the sourcing and fulfilling the three most important quality dimensions is part of it. Having accurate and complete documentation on-time in the sourcing process is invaluable. The information needs and interrelations between different stakeholders are to be reorganized to show clear ownership and measures that come to the processes.

### **5.3 Limitations and criticism**

There are certain limitations to the research in question. First, this thesis was conducted for the request of the case company and so, the solution that was created to address the challenges it was facing, is rather unique. Moreover, there is a risk that the solution proposed of introducing a supplier quality process owner to the organization's structure is not going to solve all the issues that arose during data collection. However, as the case company strives to improve the supplier quality, the newly created position could still support greatly continuous improvement activities. Currently, there is not a single person aiming to improve their processes as a side task to already existing ones.

Although, the quality measures and information needs from sourcing process point of view can be valid for companies from other industries, the thesis does not validate that fully. However, it could be assumed that the interrelation between the sourcing, other teams involved in project delivery and suppliers in an assembly based environment, can be duplicated elsewhere as well.

When collecting data, it became clear that it is impossible to gather fully objective view on processes. It was found that significant number of employees have worked most of their working years at the case company, which resulted in very strong opinions of how things should look like from the perspective of that one single person, without looking at the big picture. Of course, some alterations to the truth coming from data collection could have been caused by not understanding the question or context of it. Moreover, some of the interviewees requested to conduct the interview in Finnish, which also provides some room for error when trying to get to the essence of the statement. To gain more objective view in a wider scope, the interviews were tried to be arranged so, that as many different, yet interrelated employees would have a chance to speak out. Also, the number of the



interviews and variety of the backgrounds of the people interviewed aimed to standardize the answers and formulate a comprehensive picture of the supplier quality process. The structure of the interviews was semi-standardized, allowing free and open answers. The structure was not based directly from any theoretical framework and was designed to address the most immediate needs of the case company. When conducting a wider research, without focusing on one company, the questions could include more broader scope of themes concerning supplier quality.

Another limitation to this research was lack of the input from the supplier base. Initially there was a plan to have a few suppliers involved in the process, to gain the insight from their perspective and observe how the information needs and gaps formulate from sourcing and the supplier side. However, due to time constraints and the number of internal interviews scheduled, the plan was set aside.

## **5.4 Implications for the future research**

For the purpose of this research a total of nine internal interviews within Valmet Automation were conducted and four interviews within the rest of Valmet's business lines for benchmarking purposes. Additionally, two external companies were benchmarked. To prove the results more valid and transparent amongst different industries with sourcing activities, a benchmark of bigger number of companies would be needed. Also, interviewing suppliers would bring a broader perspective to the researched issue.

It would be an interesting approach to research the exact cause of what made the current supplier quality approach the way it is. This research showed some of the hints it being the long history of organizational changes, but it was not validated fully to state as a fact. Also, the correlation between the increasing average age of the employees of the company and their attitude towards the supplier quality approach would be intriguing to explore.

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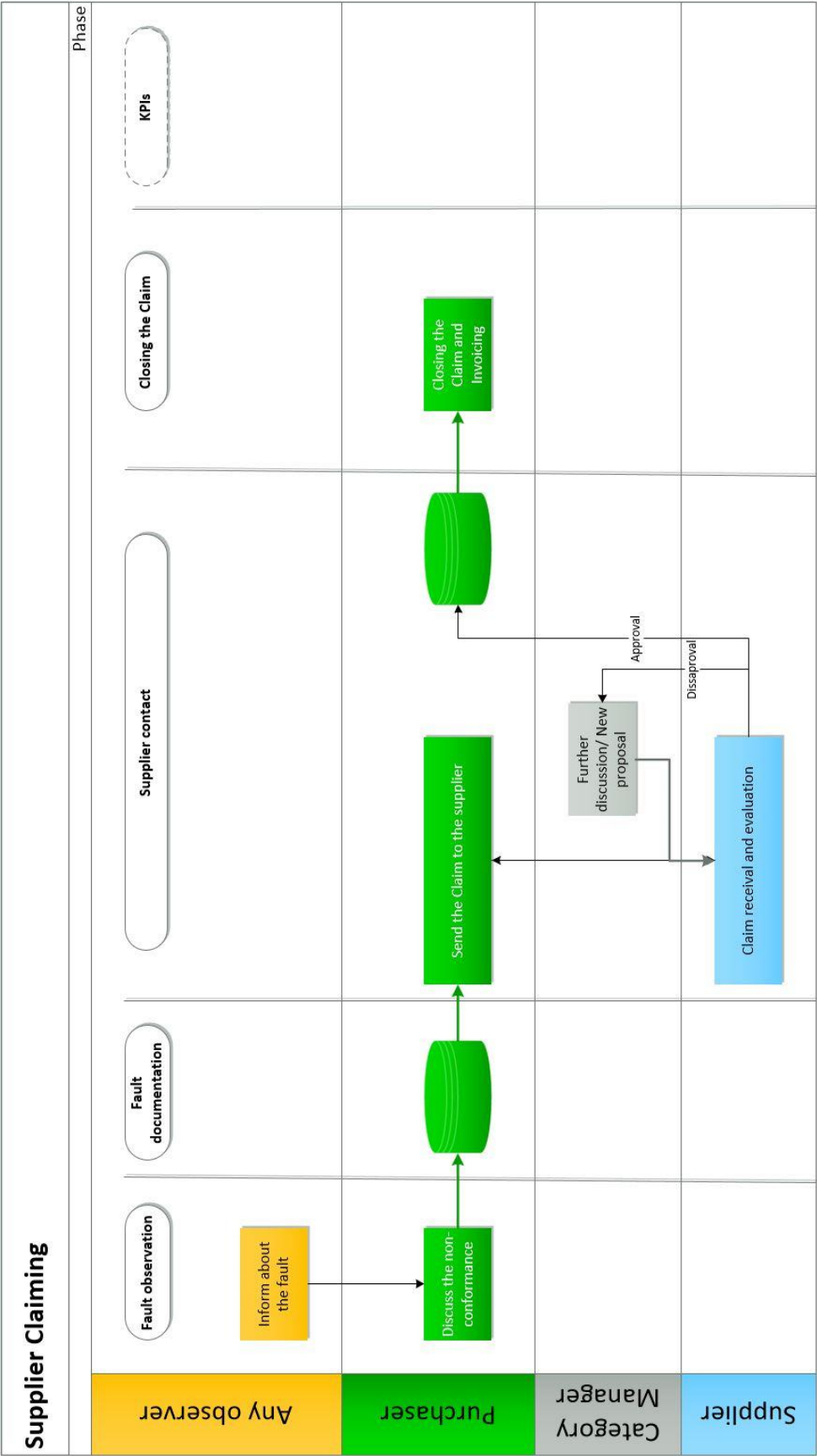
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## APPENDIX A: INTERVIEW QUESTIONS FOR CASE COMPANY REPRESENTATIVES

Short introduction about the research, the goal of improving supplier quality process monitoring. Presenting some AUT cases involving supplier quality issues.

1. What is your name and responsibilities at Valmet AUT? (formal and actual tasks)
  - a. How long have you worked at Valmet?
  - b. Is the topic of supplier quality approached in Valmet AUT (on a scale 1-10)?
  - c. If yes, how is it approached (1-2 main points)?
  - d. In your opinion, how important is supplier quality (on a scale from 1 to 10)?
2. How would you define good quality of sourced products?
  - a. In general, what are the dimensions quality is consisting of?
  - b. In your opinion, what are the most important TOP3 aspects determining good quality? Why?
3. What are the information needs of Valmet AUT concerning products and their quality?
  - a. What kind of information is needed about sourced products? And from the procurement point of view?
  - b. How about key components? Do they have more detailed/strict quality documentation requirements?
  - c. Could you describe tasks or activities where you use that information?
  - d. Do you want to say anything else about information needs?
4. What aspects in the supplier's operations and activities can affect product quality?
  - a. Are there some aspects in the supplier's operations that you see influencing delivery of excellent quality?
  - b. Would it be beneficial to get information about these aspects from the supplier?
  - c. Do you think quality assurance certificates are enough to ensure good quality?
  - d. Is there some other information that you think would be useful to get from the supplier, regarding processes, products and their quality?
5. How does [department name] monitor supplier's quality process?
  - a. In general, what are the most important measures in industrial processes? How about in AUT processes? What do we measure?
  - b. How are these measures/results used? Are they discussed with the supplier? Do you share quality KPIs with the supplier base (i.e. ranking of suppliers)?
  - c. In your opinion, how the supplier measurement could be improved?
  - d. How do customers perceive good quality?
6. Do you perceive the effect of quality on daily basis?
  - a. If yes, then how [department name] supports suppliers in improving their quality?
  - b. If no, how could you improve supplier quality on daily basis?
  - c. How ensured good quality could make your work easier?
  - d. Have you seen quality related practices in your previous work experience that are worth taking example from?
7. Are there any other thoughts or comments about information needs, sourced product quality or measurement in general? What would you like to see happening? If you could ask suppliers something about their processes related to quality topic, what would you ask?

APPENDIX B: CURRENT SUPPLIER CLAIMING PROCESS



APPENDIX C: FUTURE SUPPLIER CLAIMING PROCESS PROPOSAL

